Gigabit Ethernet Network Adapter

Advanced Control Suite for the AT-2931SX

User's Guide

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Allied Telesyn

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Preface

This guide contains instructions on how to install and configure the Advanced Control Suite software for the AT-2931SX Ethernet Network Adapter on Windows 2000, Windows 2003, and Linux platforms. For information about how to install the AT-2931SX adapter as well as procedures to install and configure the related software, see the *AT-2931SX Gigabit Ethernet Network Adapter Installation Guide* (part number 613-000049).

The Preface contains the following sections:

- ❒ “Safety Symbols Used in this Document” on page 7
- ❒ “Where to Find Web-based Guides” on page 8
- ❒ “Contacting Allied Telesyn” on page 9

Safety Symbols Used in this Document

This document uses the safety symbols defined in Table 1.

Table 1. Safety Symbols

Symbol	Meaning	Description
	Caution	Performing or omitting a specific action may result in equipment damage or loss of data.
	Warning	Performing or omitting a specific action may result in electrical shock.

Where to Find Web-based Guides

The installation and user guides for all Allied Telesyn products are available in portable document format (PDF) on our web site at **www.alliedtelesyn.com**. You can view the documents online or download them onto a local workstation or server.

Contacting Allied Telesyn

This section provides Allied Telesyn contact information for technical support as well as sales and corporate information.

Online Support

You can request technical support online by accessing the Allied Telesyn Knowledge Base: **http://kb.alliedtelesyn.com**. You can use the Knowledge Base to submit questions to our technical support staff and review answers to previously asked questions.

Email and Telephone Support

For Technical Support via email or telephone, refer to the Support & Services section of the Allied Telesyn web site: **www.alliedtelesyn.com**.

Returning Products

Products for return or repair must first be assigned a return materials authorization (RMA) number. A product sent to Allied Telesyn without an RMA number will be returned to the sender at the sender's expense.

To obtain an RMA number, contact Allied Telesyn Technical Support through our web site: **www.alliedtelesyn.com**.

Sales or Corporate Information

You can contact Allied Telesyn for sales or corporate information through our web site: **www.alliedtelesyn.com**. To find the contact information for your country, select Contact Us -> Worldwide Contacts.

Management Software Updates

New releases of management software for our managed products are available from either of the following Internet sites:

- Allied Telesyn web site: **www.alliedtelesyn.com**
- Allied Telesyn FTP server: **ftp://ftp.alliedtelesyn.com**

If you prefer to download new software from the Allied Telesyn FTP server from your workstation's command prompt, you will need FTP client software and you must log in to the server. Enter "anonymous" for the user name and your email address for the password.

Chapter 1

Advanced Server Program Overview

This chapter provides an introduction to the Allied Telesyn Advanced Server Program. It provides the following sections:

- ❒ “AT-2931SX Broadcom Advanced Server Program (BASP) Overview” on page 11
- ❒ “AT-2931SX Broadcom Advanced Control Suite (BACS) Features” on page 12
- ❒ “AT-2931SX BASP for Windows 2000 and Windows 2003” on page 13
- ❒ “AT-2931SX BASP for Linux” on page 14

AT-2931SX Broadcom Advanced Server Program (BASP) Overview

AT-2931SX BASP is an intermediate software driver for Windows Server 2003, Windows 2000, and Linux that provides load-balancing, fault-tolerance, and VLAN features. This manual covers BASP for the Windows 2000 and Linux platforms.

The BASP features are provided by creating teams (virtual adapters) that consist of multiple NIC interfaces. A team can consist of one to eight NIC interfaces. Each interface can be designated as a primary or standby* interface. All primary interfaces in a team participate in Load-balancing operations by sending and receiving a portion of the total traffic. Standby interfaces take over in the event that all primary interfaces have lost their links. VLANs can be added to a team to allow multiple VLANs with different VLAN IDs. A virtual adapter is created for each VLAN added. Load-balancing and fault-tolerance features work with any third party's NIC adapters, but will only be supported with the AT-2931SX adapter. VLANs only work with the AT-2931SX adapters.

Note
**Standby can only be used in Smart Load-Balance mode (see Limitations below).*

Smart Load-balance (SLB) mode works with all Ethernet switches without configuring the switch ports to any special trunking mode. Only IP traffic will be load-balanced in both inbound and outbound directions. In comparison, IPX traffic will be load-balanced in the outbound direction only. Other protocol packets will be sent and received through one primary NIC only. Fault-tolerance for non-IP traffic is only supported using AT-2931SX adapters. The Generic Trunking mode requires the Ethernet switch to support some form of port trunking mode (for example, Cisco's Gigabit EtherChannel or other switch vendor's link aggregation mode). This mode is protocol-independent and all traffic should be load-balanced and fault-tolerant.

Note
Allied Telesyn recommends disabling the spanning tree protocol at the switch when using BASP. This will minimize the downtime due to spanning tree loop determination when failing over.

Note
The AT-2931SX Broadcom Advanced Server Program (BASP) requires that at least one adapter in the team must be a AT-2931SX adapter.

AT-2931SX Broadcom Advanced Control Suite (BACS) Features

The AT-2931SX Broadcom Advanced Control Suite (BACS) is a graphical user interface with the following functions. See Chapter 2, “AT-2931SX Broadcom Advanced Control Suite (BACS) Applications” on page 15 for additional information.

- Vital Sign – The Vital Sign screen allows you to view vital adapter information, network status, and network connectivity. Active Adapters are listed.
- Resources – Shows the system resources of the selected device.
- Hardware – Shows the hardware information (the ASIC version and the firmware version) for the selected device.
- Network Test – The Network Test screen allows you to verify IP network connectivity. This test verifies if the NDIS driver is installed correctly. Also, it tests connectivity to a gateway or other specified IP address on the same subnet.
- Diagnostics – The Diagnostics screen allows you to view information about adapters. This function is used to test the network interface card.
- Configuration – Sets configuration options (NIC Battery Saving Mode, for example).
- Statistics – The Statistics screen allows you to view traffic statistics for both the AT-2931SX adapter as well as adapters from other vendors. Statistical values and coverage is more comprehensive for the AT-2931SX adapter.
- Load Balance/Virtual LAN – The Load Balance/Virtual LANs screen allows you to configure advanced features. Any available adapter can be configured as part of a team.

AT-2931SX BASP for Windows 2000 and Windows 2003

The following options are supported under Windows 2000 and Windows 2003. For additional information, see Chapter 3, "Installing BACS on Windows 2000 and Windows 2003 Systems" on page 44.

Failover and Load Balance

- Adapter teaming for failover
- Smart Load Balance™
- Smart Load Balance (auto-failback disable)
- Generic Link Aggregation (GEC/FEC, Open trunk)
- Link aggregation (IEEE 802.3ad)

Virtual LAN (VLANs)

- Up to 64 VLANs (63 tagged and 1 untagged) per adapter using IEEE 802.1Q-1988 tagging. VLANs are supported with AT-2931SX adapters only.

AT-2931SX BASP for Linux

The following options are supported under Linux. For additional information, see Chapter 4, “Installing BACS on a Linux System” on page 47.

Failover and Load Balance

- SLB mode requires NICE drivers and works with all Ethernet switches without configuring the switch ports to any special trunking mode. Only IP traffic will be load-balanced in both inbound and outbound directions.
- Generic trunking mode does not require NICE and can work with any NIC; however, it requires the Ethernet switch to support the technology and be properly configured. This mode is protocol-independent and all traffic should be load-balanced and fault-tolerant.
- 802.3ad mode requires NICE drivers and Ethernet switches supporting IEEE 802.3ad Link Aggregation. This mode is protocol-independent and all traffic should be load-balanced and fault-tolerant. All the physical interfaces in the 802.3ad teams are defaulted to be LACP active. A 802.3ad team requires all the member NICs support NICE. All the member NICs, once in the 802.3ad team, will be set with the same MAC address.

Virtual LAN (VLAN)

- VLANs can be added to a team to allow multiple VLANs with different VLAN IDs. A virtual device is created for each VLAN added.

Chapter 2

AT-2931SX Broadcom Advanced Control Suite (BACS) Applications

This chapter describes the AT-2931SX Broadcom Advanced Control Suite (BACS) Applications. It contains the following sections:

- “Overview” on page 16
- “Installing the AT-2931SX BACS Application” on page 18
- “Updating the AT-2931SX BACS Application” on page 20
- “Removing the AT-2931SX BACS Application” on page 21
- “Initializing the AT-2931SX BACS Application” on page 22
- “Configuring the AT-2931SX BACS Application” on page 23

Overview

The AT-2931SX Broadcom Advanced Control Suite (BACS) application is an integrated application (with a graphical user interface) that provides useful information about each network adapter that is installed in your computer. The BACS application also enables you to perform detailed tests, diagnostics, and analyses on each adapter, as well as view traffic statistics and set configuration options for each adapter. See Figure 1. The BACS application is designed to run on Windows 2000 and Windows 2003 operating systems.

The AT-2931SX Broadcom Advanced Server Program (BASP) application, which runs within BACS, is used to configure load balancing, fault tolerance, and virtual local area networks (VLANs). This application is available only on computers that use more than one network adapter.

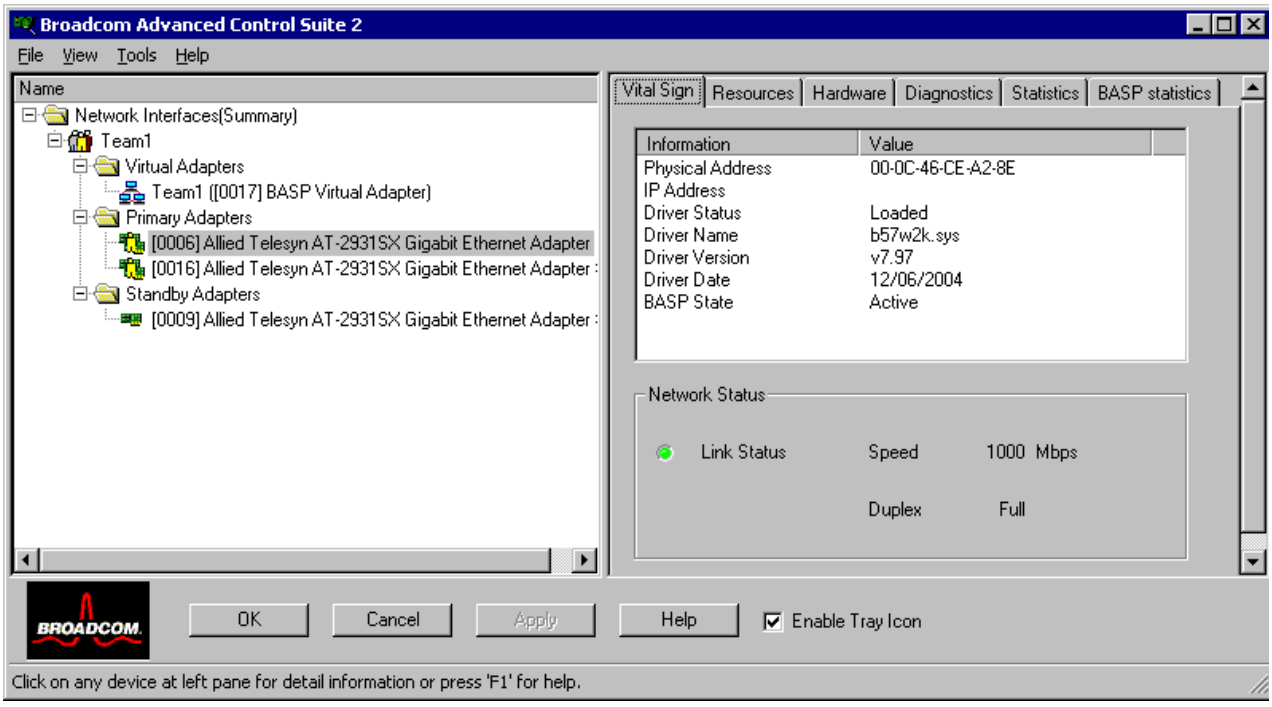

Figure 1. Advanced Control Suite 2 Menu

Information Provided by the BACS Applications

The **AT-2931SX Broadcom Advanced Control Suite** lists all of the network adapters in your computer and provides the following information, if available, about each device. See Table 2.

Table 2. BACS Application Information

Driver Status	Driver Version	Frames Rx OK
MAC Address	Driver Date	Team Name
Link Status	Firmware Version	Team Type
IP Address	ASIC Version	VLAN Name
Memory Address	Bus Type	VLAN ID
Physical Address	Bus No.	BASP Tx Packet
Speed	Device No.	BASP Tx Packet Discarded
Duplex	Function No.	BASP Tx Packet Queried
Slot No.	Interrupt Request	BASP Rx Packet
Driver Name	Frames Tx OK	BASP Rx Packet Discarded

BACS Features

The following features are accessible from the BACS application:

- "Vital Sign" on page 23. Provides at-a-glance status reports on all of the LAN devices in your computer.
- "Resources" on page 26. Displays the system resources of the selected device.
- "Hardware" on page 27. Displays the hardware information (the ASIC version and the firmware version) for the selected device.
- "Network Test" on page 28. Confirms network connectivity to a remote station. The network test sends ICMP packets to remote systems and waits for a response. If a gateway is configured, the test automatically sends packets to that system. If a gateway is not configured or if the gateway is unreachable, the test prompts you for a destination IP address.
- "Diagnostics" on page 28. Performs comprehensive diagnostics on Broadcom network adapters.
- "Statistics" on page 30. Provides detailed performance statistics on each selected device.
- "BASP Statistics" on page 33. Configures the load balance and failover by grouping multiple network adapters.

Installing the AT-2931SX BACS Application

The AT-2931SX Broadcom Advanced Control Suite (BACS) software can be installed through the GUI or by using the silent install option. See the following procedures:

- ❒ “Installing with the GUI” on page 18
- ❒ “Using Silent Installation” on page 19

Note
Before installing the BACS software on a computer running Windows 2000 Advanced Server with Terminal Services, type **change user /install** from the DOS command prompt.

Installing with the GUI

To install the AT-2931SX BACS application using the GUI (graphical user interface), perform the following procedure.

Note
Before you begin the installation, close all applications, windows, and dialog boxes

1. Double-click **setup.exe**.
2. Click **Next** in **Broadcom Management Programs Setup**.
3. Read the license agreement and click **Yes**.
4. In **Select Components**, click the component you want to install:
   - **Control Suite**. Installs the Broadcom Advanced Server Control Suite.
   - **BASP**. Installs the Broadcom Advanced Server Program.
   - **SNMP Service**. Installs the Advanced Server SNMP subagent.
   - **CIM Provider**. Installs the CIM Provider.

Note
The Microsoft SNMP Service must be running for the SNMP Service application to function properly.

5. Follow the on-screen instructions.

You can start the Control Suite from the Control Panel by double-clicking **Broadcom Control Suite 2**. Or, click **Start**, point to **Programs**, point to **Broadcom**, and then click the **Broadcom Advanced Control Suite**.

Using Silent Installation

The recommended installation procedure is to copy the installation files to your hard disk before you run the silent install. This recommendation exists because the **setup /s** command automatically generates a Setup.log file in the directory where it is run.

Note
Before you begin the installation, close all applications, windows, and dialog boxes.

1. Type **setup /s** and press **ENTER**.

Updating the AT-2931SX BACS Application

To update the AT-2931SX BACS application on your computer, perform the following procedure.

Note
Before you begin the update, close all applications, windows, and dialog boxes.

1. Double-click **Setup.exe**.
2. Click **Next** in **Broadcom Management Programs Setup**.
3. Read the license agreement and click **Yes**.
4. In **Select Components**, click the component you want to install:
   - **Control Suite**. Installs the Broadcom Advanced Server Control Suite.
   - **BASP**. Installs the Broadcom Advanced Server Program.
   - **SNMP Service**. Installs the Advanced Server SNMP subagent.
   - **CIM Provider**. Installs the CIM Provider.

Note
The Microsoft SNMP Service must be running for the SNMP Service application to function properly.

5. Follow the on-screen instructions.

Removing the AT-2931SX BACS Application

To remove the AT-2931SX BACS application from your computer, perform the following procedure.

1. In Control Panel, double-click **Add/Remove Programs**.
2. Click **Broadcom Management Programs** and click **Change/Remove** (Windows XP) or **Add/Remove** (Windows 2000).
3. Click **Next**.
4. In **InstallShield Wizard**, click **Remove**, and then click **Next**.
5. Click **OK** to remove the application and all of its components.
6. Click **OK**.
7. Restart your computer.

Initializing the AT-2931SX BACS Application

To initialize the AT-2931SX Broadcom Advanced Control Suite (BACS) application on your computer, perform the following procedure.

1. In Control Panel, double-click **Broadcom Control Suite**.

   Or, click **Start**, point to **Programs**, point to **Broadcom**, and then click **Broadcom Advanced Control Suite**.

   Note
   You must install the AT-2931SX adapter before you initialize the BACS application.

Configuring the AT-2931SX BACS Application

Start the AT-2931SX BACS application and then click the tab on **Broadcom Advanced Control Suite** that provides the information of interest or access to the tests, diagnostics, analyses, and configuration functions you want to perform. Or, from the **Tools** menu, click **Create a Team** to start the BASP application. Select from the following tabs:

- ❒ "Vital Sign" on page 23
- ❒ "Resources" on page 26
- ❒ "Hardware" on page 27
- ❒ "Network Test" on page 28
- ❒ "Diagnostics" on page 28
- ❒ "Statistics" on page 30
- ❒ "Configuring Teaming" on page 34

Vital Sign

The Vital Sign Tab contains information about the AT-2931SX adapter and other network adapters that are installed, the link status of the network, and network connectivity. To view this information for any installed network adapter, click the name of the device. See Figure 2 on page 24.

Note
Information about network adapters made by other vendors is less comprehensive than the information provided about the AT-2931SX adapter.

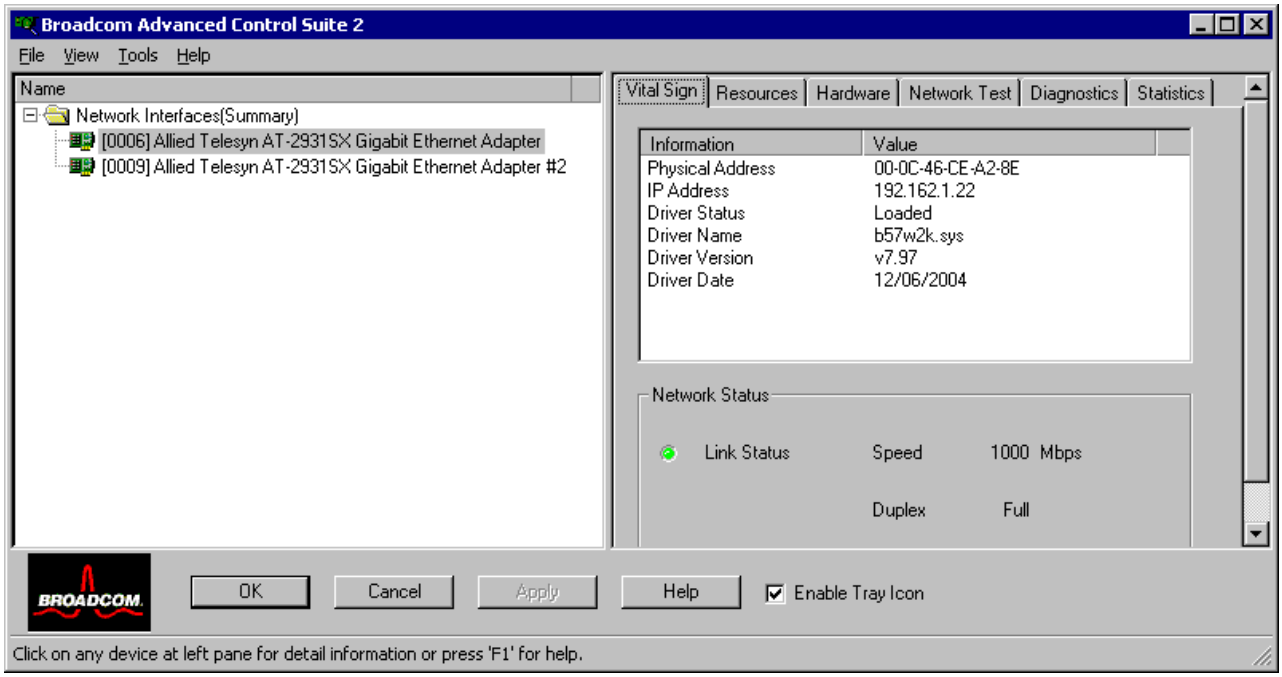

Figure 2. Vital Sign Tab

The Vital Sign Tab contains the following fields:

- **Physical Address**. This is a physical MAC (media access control) address that is assigned to the device by the manufacturer. The physical address cannot be all 0s.
- **IP Address.** The network address that is associated with the device. If the IP address is all 0's, the associated driver has not been bound with the Internet Protocol (IP).
- **Driver Status**. Information about the status of the driver that is associated with the selected controller.
  - **Driver Loaded**. Normal operating mode. The driver that is associated with the device has been loaded by Windows and is functioning.
  - **Driver Not Loaded**. The driver that is associated with the device has not been loaded by Windows.
  - **Information Not Available**. The value is not obtainable from the driver that is associated with the device.

- **Driver Name/Version/Date**. The file name, version, and creation date of the software driver that is associated with the device.
- **BASP State**. Information about the status of the BASP application. This information appears only when there is a team. See "Configuring Teaming" on page 34
- **Network Status**: The following network status information is provided:
  - **Link Status**. The indicator is green if a link is established. A red indicator means that a link is not established.
  - **Speed**. The link speed of the device.
  - **Duplex**. The duplex mode in which the device is operating.

Resources

This section describes the Resources Tab. See Figure 3.

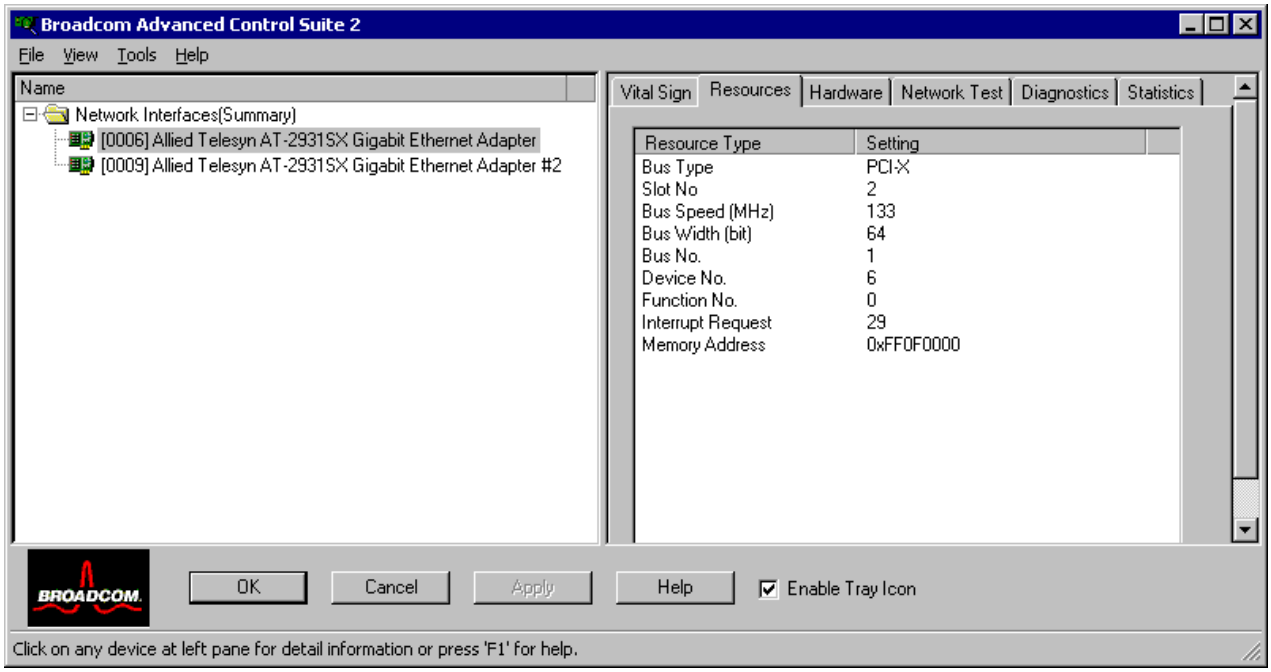

Figure 3. Resources Tab

The Resources Tab contains the following fields:

- **Bus Type.** Indicates the PCI bus type (PCI or PCI-X).
- **Slot No**. Indicates the PCI slot number of the installed AT-2931SX adapter.
- **Bus Speed (MHz)**. Indicates the PCI bus speed (33, 66, 100, or 133 MHz).
- **Bus Width (bit)**. Indicates the PCI bus data width of either 32 or 64 bits.
- **Bus No**. Indicates the PCI bus number and the device number for the device.

  Example: [0] 14 indicates that the AT-2931SX controller resides in PCI bus 0, device 14.

- **Device No**. The number assigned to the device by the operating system.
- **Function No**. The port number of the adapter. For a single-port adapter, the function number is 0. For a two-port adapter, the function number for the first port is 0, and the function number for the second port is 1.
- **Interrupt Request**. The interrupt line number that is associated with the device. Valid numbers range from 2 to 25.

- **Memory Address**. The memory mapped address that is assigned to the device. This value can never be 0.

Hardware

This section provides a description of the Hardware Tab. See Figure 4.

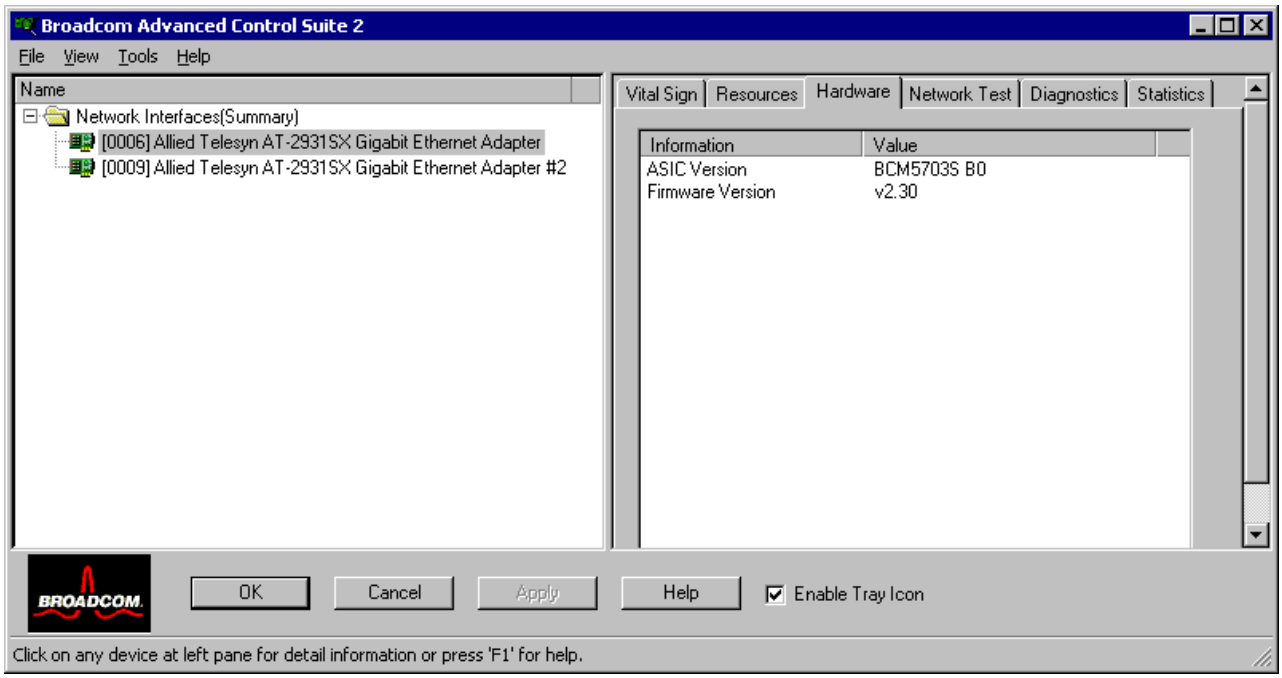

Figure 4. Hardware Tab

The Hardware Tab contains the following fields:

- **ASIC Version**. The chip version of the AT-2931SX adapter. This information is not available for devices made by other vendors.
- **Firmware Version**. The firmware version of the AT-2931SX adapter. This information is not available for devices made by other vendors.

Network Test

From the Network Test Tab, you can verify IP network connectivity. This test verifies if the driver is installed correctly and tests connectivity to a gateway or other specified IP address on the same subnet. The Network test uses TCP/IP. See Figure 5 on page 28.

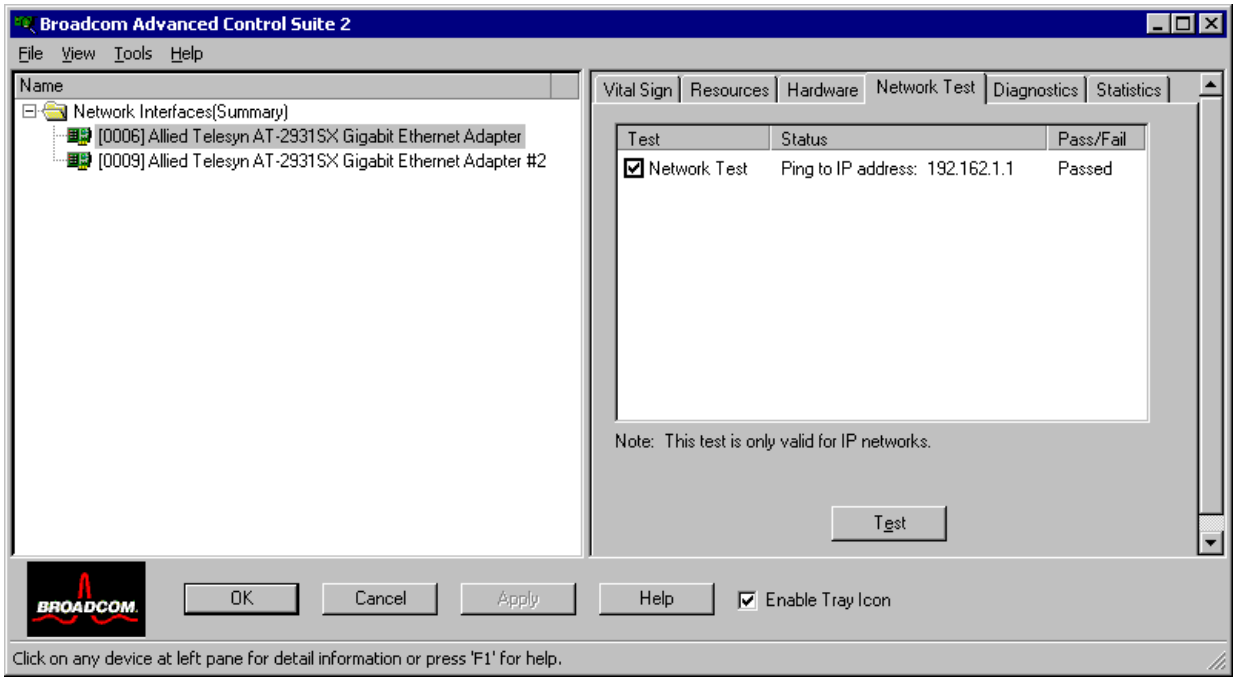

Figure 5. Network Test Tab

Diagnostics

From the Diagnostics Tab you can perform diagnostic tests on AT-2931SX network adapters. This function is used to test the physical components of the adapter. See Figure 6 on page 29.

Note
The network connection is temporarily lost when the diagnostic tests are running.

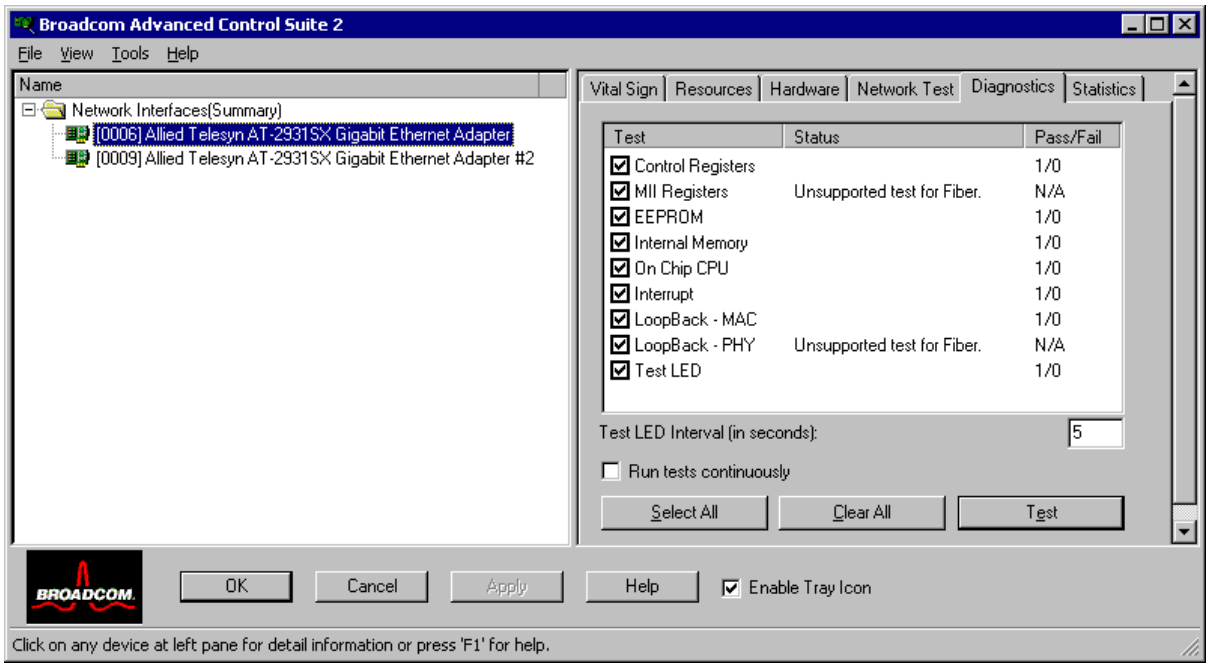

Figure 6. Diagnostics Tab

The Diagnostics Tab contains the following fields:

- **Control Registers**. This test verifies the read and write capabilities of the network controller registers by writing various values to the registers and verifying the results. The device driver uses these registers to perform network functions such as sending and receiving information. If the test fails, the device may not work properly.
- **MII Registers**. This test verifies the read and write capabilities of the registers of the physical layer (PHY).
- **EEPROM**. This test verifies the content of the electrically erasable programmable read-only memory (EEPROM) by reading a portion of the EEPROM and computing the checksum. The test fails if the computed checksum is different from the checksum stored in the EEPROM. An EEPROM image upgrade does not require a code change for this test.
- **Internal Memory**. This test verifies that the internal memory of the device is functioning properly. The test writes patterned values to the memory and reads back the results. The test fails if an erroneous value is read back. The device cannot function without its internal memory.
- **On-Chip CPU**. This test verifies the operation of the internal CPUs in the device.

- **Interrupt**. This test verifies that the NDIS driver is able to receive interrupts from the device.
- **Loopback MAC**. This test verifies that the Network Device Driver Interface Specification (NDIS) driver is able to send packets to and receive packets from the device.
- **Test LED**. This test causes all of the LEDs to blink 5 times for the purpose of identifying the device.

Statistics

On the Statistics Tab, you can view traffic statistics for both Allied Telesyn network devices and network devices made by other vendors. Statistical information and coverage are more comprehensive for the AT-2931SX adapter.

> **Note**
> If an AT-2931SX adapter is disabled, team statistics are not displayed.

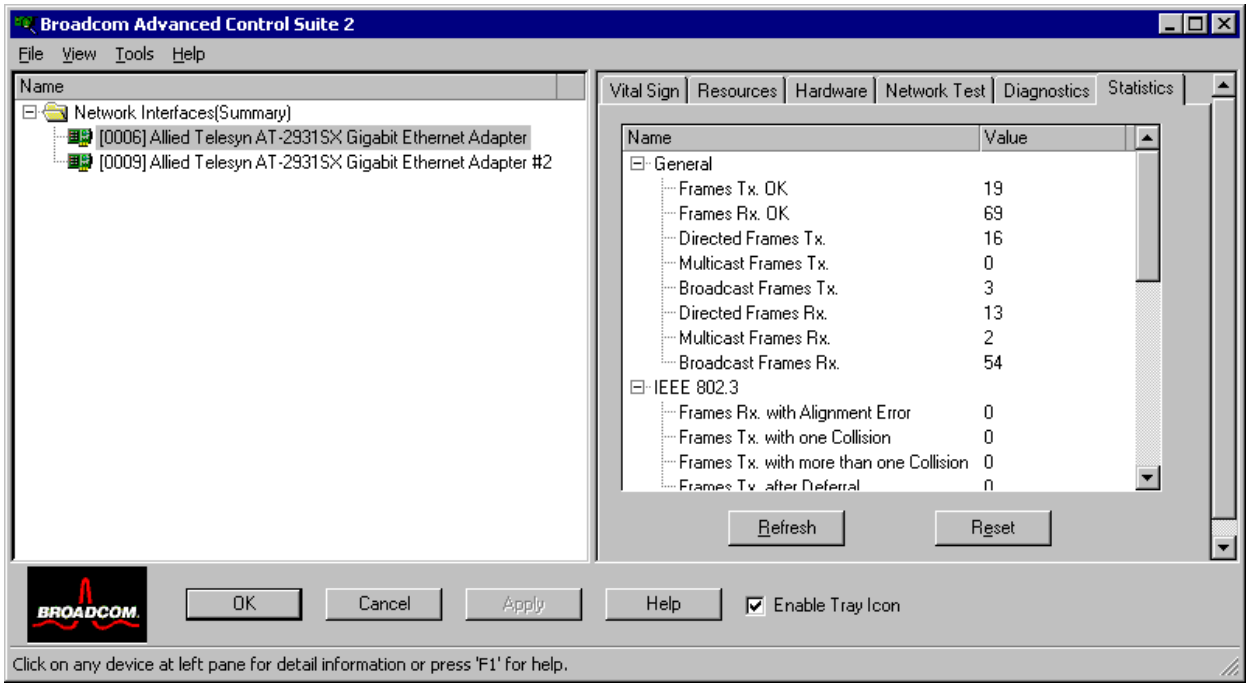

Figure 7. Statistics Tab

General Statistics

Definitions of the general statistics parameters are provided below.

- **Frames Tx OK**. A count of frames that are successfully transmitted. This counter is incremented when the transmit status is reported as **Transmit OK**.
- **Frames Rx OK**. A count of frames that are successfully received (**Receive OK**). This does not include frames received with frame-too-long, frame check sequence (FCS), length or alignment errors, or frames lost due to internal MAC sublayer errors. This counter is incremented when the receive status is reported as **Receive OK**.
- **Directed Frames Tx**. A count of directed data frames that are successfully transmitted.
- **Multicast Frames Tx**. A count of frames that are successfully transmitted (as indicated by the status value **Transmit OK**) to a group destination address other than a broadcast address.
- **Broadcast Frames Tx**. A count of frames that were successfully transmitted (as indicated by the transmit status **Transmit OK**) to the broadcast address. Frames transmitted to multicast addresses are not broadcast frames and, therefore, are excluded.
- **Directed Frames Rx**. A count of directed data frames that are successfully received.
- **Multicast Frames Rx**. A count of frames that are successfully received and are directed to an active nonbroadcast group address. This does not include frames received with frame-too-long, FCS, length errors, alignment errors, or frames lost due to internal MAC sublayer errors. This counter is incremented as indicated by the **Receive OK** status.
- **Broadcast Frames Rx**. A count of frames that are successfully received and are directed to a broadcast group address. This count does not include frames received with frame-too-long, FCS, length errors, alignment errors, or frames lost due to internal MAC sublayer errors. This counter is incremented as indicated by the **Receive OK** status.

IEEE 802.3 Statistics

Definitions of the IEEE 802.3 statistics parameters are provided below.

- **Frames Rx with Alignment Error**. A count of frames that are not an integral number of octets in length and do not pass the FCS check. This counter is incremented when the receive status is reported as **Alignment Error**.
- **Frames Tx with one Collision**. A count of frames that are involved in a single collision and are subsequently transmitted successfully. This

counter is incremented when the result of a transmission is reported as **Transmit OK** and the attempt value is 2.

- **Frames Tx with more than one Collision**. A count of frames that are involved in more than one collision and are subsequently transmitted successfully. This counter is incremented when the transmit status is reported as **Transmit OK**, and the value of the attempts variable is greater than 2 and less or equal to the attempt limit.
- **Frames Tx after Deferral**. A count of frames whose transmission was delayed on the first attempt because the medium was busy. The frames involved in any collision are not counted.

Custom Statistics

Definitions of the custom statistics parameters are provided below.

> **Note**
> Custom statistics are available only for an enabled AT-2931SX adapter.

- **Number of Interrupts generated by this adapter**. The number of interrupts generated by the device.
- **Number of Interrupts avoided by this adapter**. The number of interrupts avoided by the device.
- **Tx Max Coalesce Frames Threshold hit**. The number of times the *Send Max Coalesce Frames Threshold* was hit.
- **Rx Max Coalesce Frames Threshold hit**. The number of times the *Receive Max Coalesce Frames Threshold* was hit.
- **DMA write Queue was full**. The number of times the *DMA write queue* was full.
- **DMA write High Priority Queue was full**. The number of times the *DMA write high priority queue* was full.
- **DMA Read Queue was full**. The number of times the *DMA read queue* was full.
- **DMA Read High Priority Queue was full**. The number of times the *DMA read high priority queue* was full.
- **Send Data Completion FTQ was full**. The number of times the *send data completion FTQ (flow through queue)* was full.
- **NIC ran out of the Recv Buffer**. The number of times the network adapter ran out of the Recv Buffer descriptors.
- **Frames size less than 64-byte with bad FCS**. The number of frames with a size less than 64 bytes with bad FCS.
- **MAC Rx w/ Pause Command and Length = 0**. MAC control frames with the **pause** command and a length equal to 0.

- **MAC Rx w/ Pause Command and Length greater than 0**. MAC control frames with the **pause** command and a length greater than 0.
- **MAC Rx w/ no Pause Command**. MAC control frames with no **pause** command.
- **MAC Sent X-on**. MAC Transmit with X-on was on.
- **MAC Sent X-off**. MAC Transmit with X-on was off.

BASP Statistics

On the BASP Statistics Tab you can view performance information about the network adapters that are on a team. To view this information for any team member adapter, click the name of the device. To view the BASP statistics for the team as a whole, click the name of the team. See Figure 8.

Note
To see the BASP Statistics Tab, you must have a team.

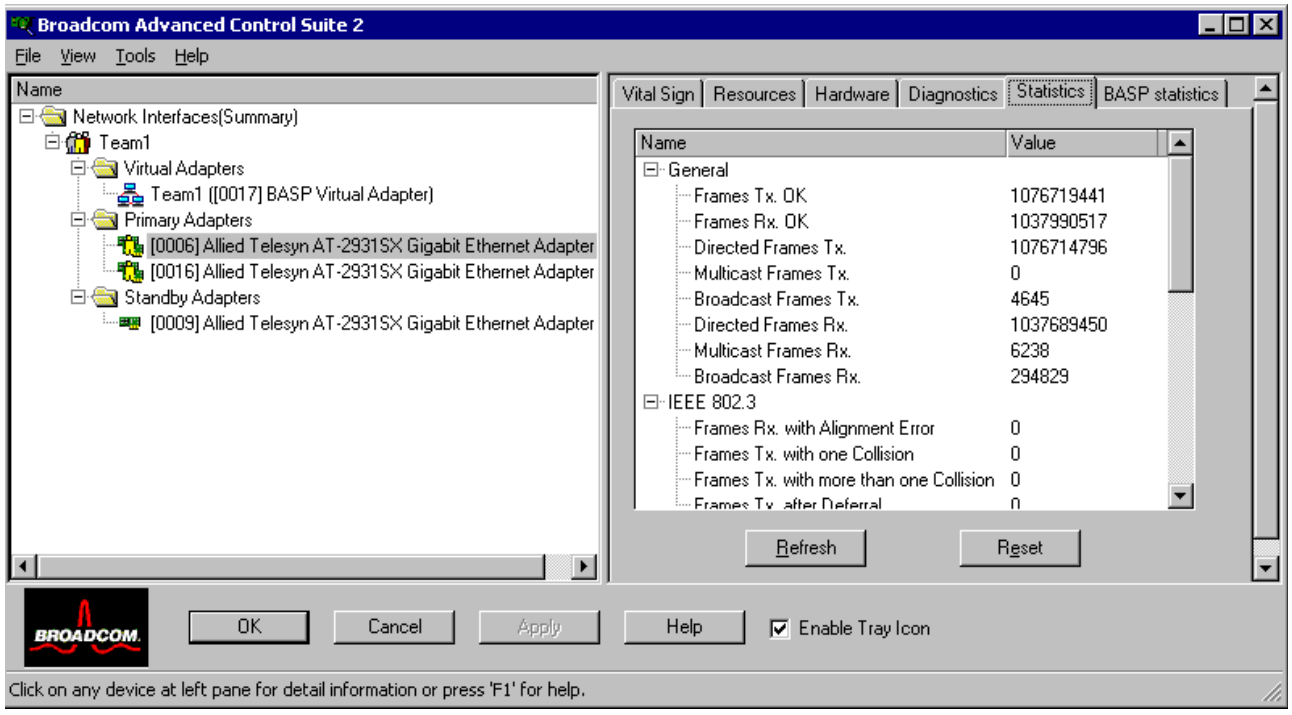

Figure 8. BASP Statistics Tab

Configuring Teaming

The teaming function allows you to group available network devices together to function as a team. Teaming is a method of creating a virtual LAN (a group of multiple devices that function as a single device). The benefit of this approach is that it enables load balancing and failover. Teaming is done via BASP. For more information about BASP, see “Overview” on page 16.

> **Note**
> AT-2931SX BASP is available only on computers that use at least one AT-2931SX Ethernet controller.

An example of this usage is shown in Figure 9. This example shows three network adapters in the **Available Adapters** list. When these adapters are moved to the **Load Balance Members** list, they function as a single adapter—that is, each member shares the traffic burden.

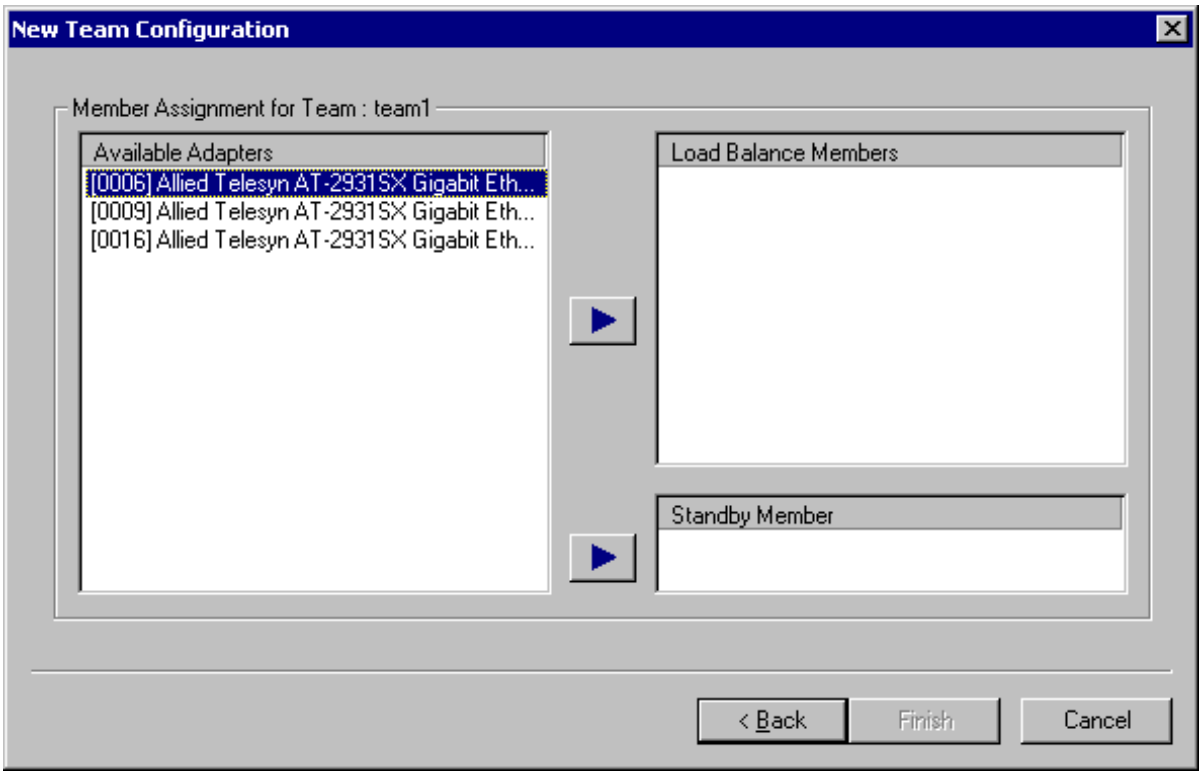

Figure 9. New Team Configuration Menu

There are 4 types of load balance teams:

- **Smart Load Balance and Failover**. In this type of team, a standby member handles the traffic if all of the load balance members fail (a failover event). All load balance members have to fail before the standby member takes over. When one or more of the load balance

members is restored (fallback), the restored team member(s) resumes the handling the traffic.

- **Link Aggregation**. In this type of team, you can dynamically configure the network adapters that have been selected to participate in a given team. If the link partner is not correctly configured for IEEE 802.3ad link configuration, errors are detected and noted. All adapters in the team are configured to receive packets for the same MAC address. The outbound load balancing scheme is determined by the BASP driver. The team's link partner determines the load balancing scheme for inbound packets. In this mode, at least one of the link partners must be in active mode.
- **Generic Trunking**. This type of team is very similar to the Link Aggregation type in that all of the adapters in the team need to be configured to receive packets for the same MAC address. However, this mode, does not provide Link Aggregation Control Protocol (LACP) or marker protocol support. This mode supports a variety of environments where the link partners are statically configured to support a proprietary trunking mechanism. Generic trunking supports load balancing and failover for both outbound and inbound traffic.
- **SLB (Auto-Fallback Disable)**. This team is identical to Smart Load Balance and Failover, with the following exception—when the standby member is active, if a primary member comes back on line, the team continues using the standby member instead of switching to the primary member. This type of team is supported only for situations in which the network cable is disconnected and reconnected to the network adapter. It is not supported when the adapter is removed or installed via the Device Manager or a Hot-Plug PCI application.

Creating a Team

To create a team, perform the following procedure.

1. From the **Tools** menu, click **Create a Team** as shown in Figure 10.

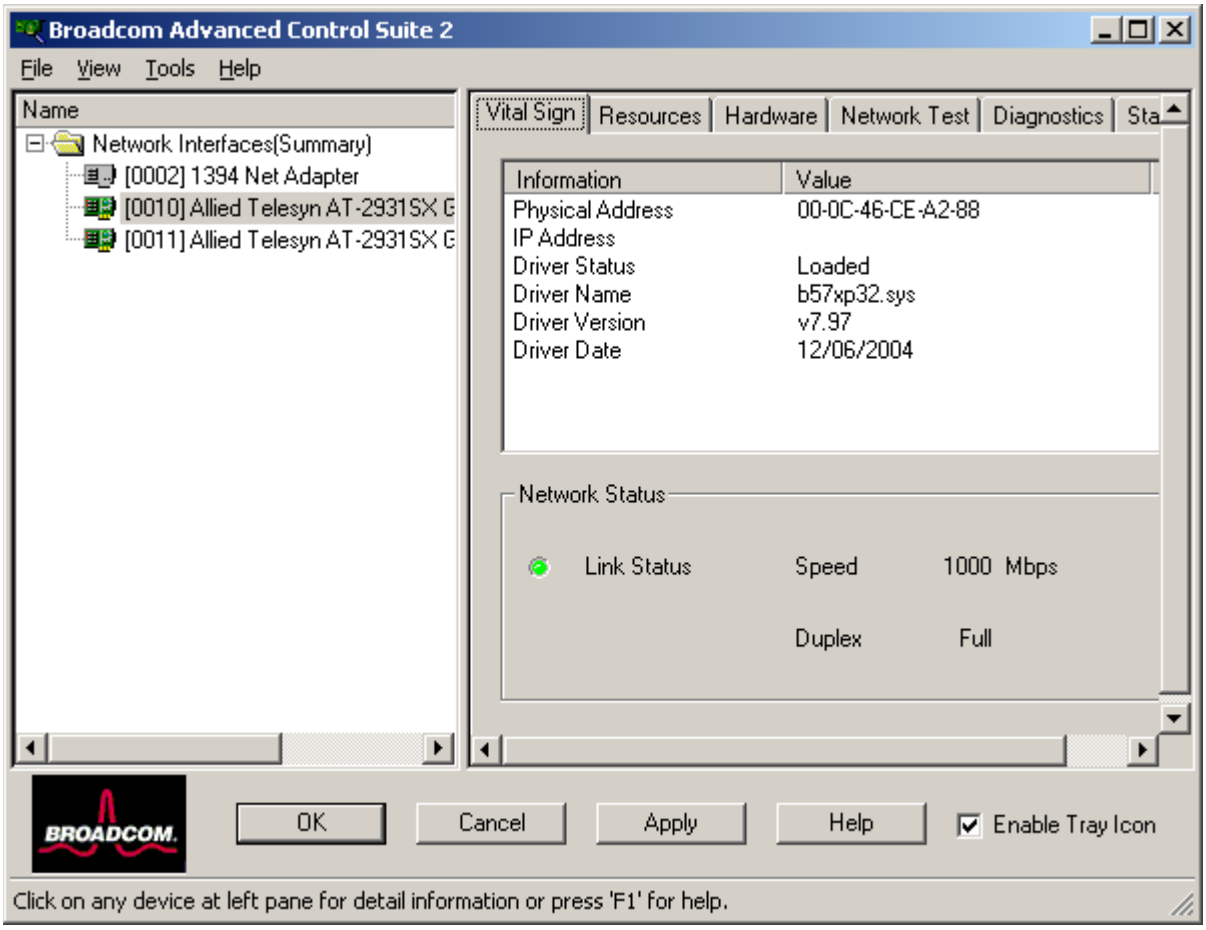

Figure 10. Advanced Control Suite 2 Menu

2. Type a team name in the **Enter a name you will use to identify this team** box. See Figure 11 on page 37.

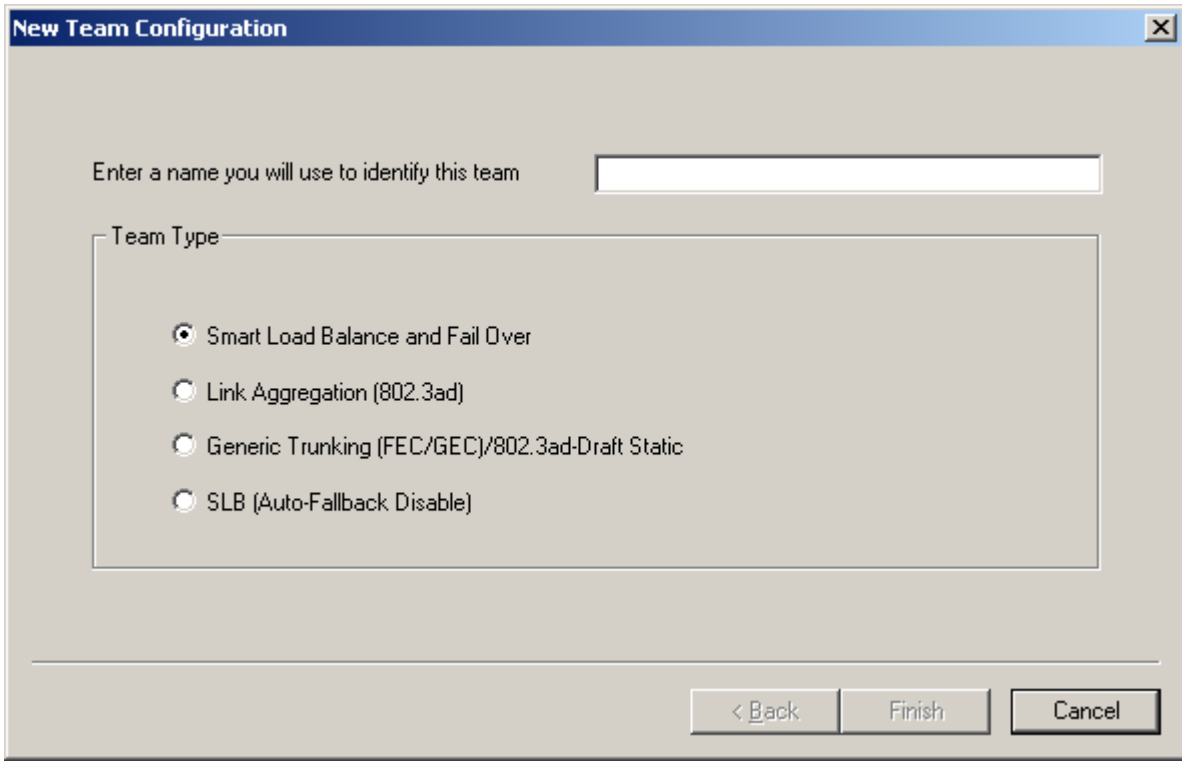

Figure 11. New Team Configuration

3. Click the type of team and click **Next**.

4. Assign any available device or devices to the team by moving the device from the **Available Adapters** list to the **Load Balance Members** list.

   See Figure 12 on page 38. There must be at least one device in the **Load Balance Members** list.

> **Note**
> There must be at least one AT-2931SX adapter assigned to the team.

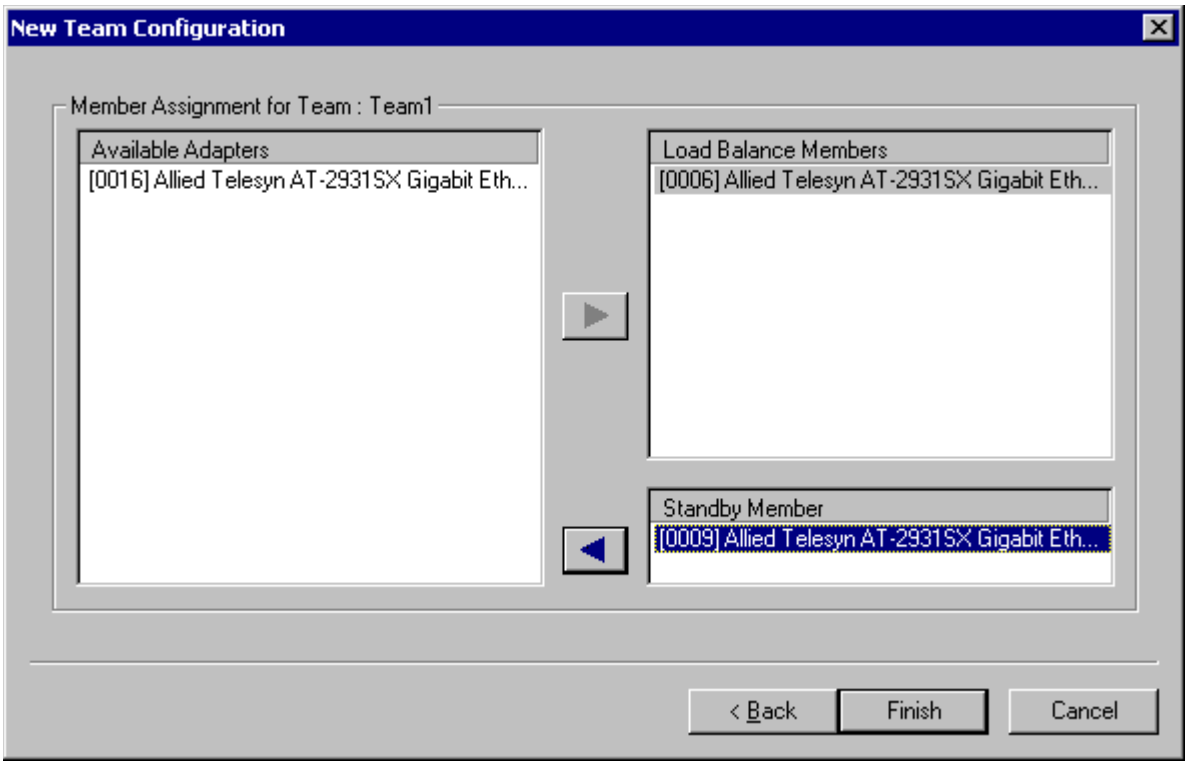

Figure 12. New Team Configuration Menu, Creating a Team

5. Click **Finish**.
6. Click **Apply**.
7. Click **Yes** when you see the message indicating that the network connection will be temporarily interrupted.

Note
The number of characters that can be used in a team name is a minimum of 1 and a maximum of 39.

Note
A team name cannot begin with spaces or contain the character "&".

Note
Team names must be unique. If you attempt to use a team name more than once, an error message appears indicating that the name already exists.

Note
The maximum number of members in a team is 8.

Note
When team configuration has been correctly performed, a Virtual Team adapter driver is created for each configured team.

Note
If you disable a virtual team and later want to reenable it, you must first disable and reenable all team members before you reenable the virtual team.

Note
When you create *Generic Trunking* and *Link Aggregation* teams, you cannot designate a Standby Member. Standby members work only with *Smart Load Balance and Failover* and *SLB (Auto-Fallback Disable*) types of teams.

Note
For an *SLB (Auto-Fallback Disable)* team, when you want to restore traffic to the load balance members from the standby member, click the **Fallback** button on the **Team Properties** Tab.

Note
Not all network devices made by other vendors are supported or fully certified for teaming.

8. Configure the Team IP address if necessary.

   If other network devices in your computer use TCP/IP bindings, the **TCP/IP Properties** windows is displayed.

9. Configure the IP address and any other necessary TCP/IP configuration for the team and click **OK** when finished.

Modifying a Team

After you have created a team, you can modify the team in the following ways:

- Change the type of team
- Change the members assigned to the team

- ❒ Add a VLAN
- ❒ Remove a team or a VLAN

To modify a team, perform the following procedure.

1. Right-click the name of the team you want to modify and click **Configure Team** as shown in Figure 13.

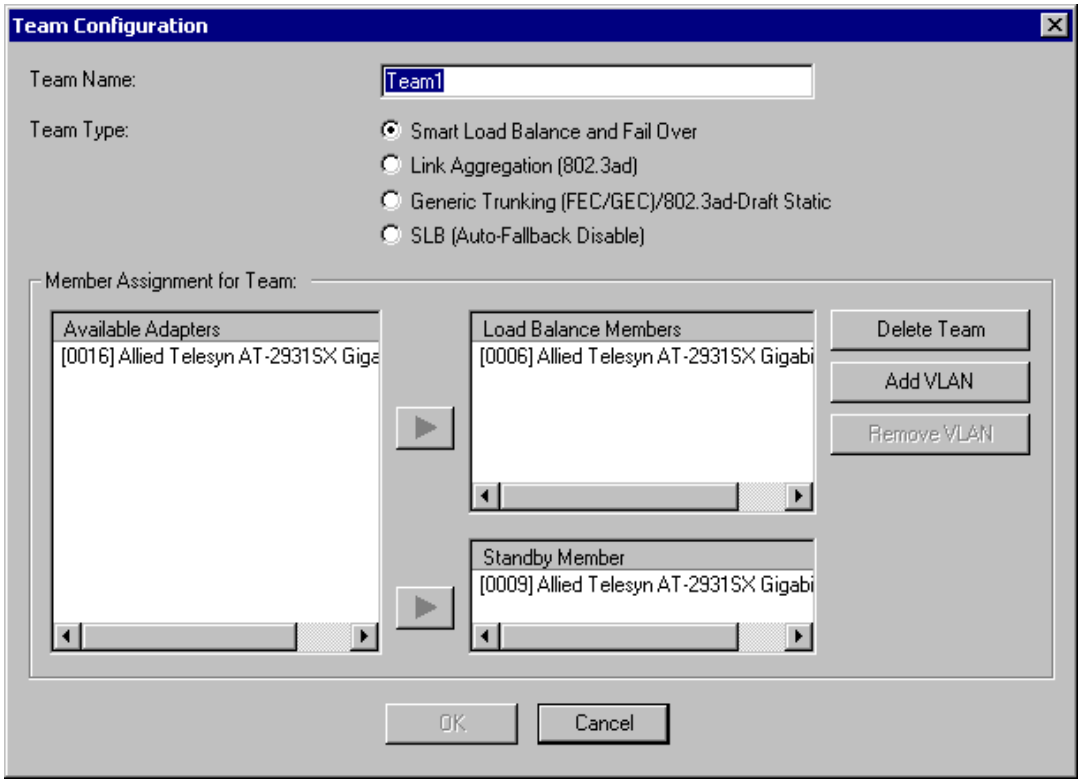

Figure 13. Team Configuration, modifying a team

2. Make the desired changes and click **OK**.
3. Click **Apply**.
4. Click **Yes** when you see the message indicating that the network connection will be temporarily interrupted.

Viewing the Team Properties and Statistics

To view the team properties and statistics, perform the following procedure.

1. Click the name of the newly created team.

   The **Team Properties** Tab is selected by default.

2. Click the **Statistics** Tab to view the team statistics.

Adding a VLAN

You also can add VLANs to a team. The concept behind this is that you are adding multiple virtual adapters that are on different subnets. The benefit is that your server can have one network adapter that can belong to multiple subnets. With a VLAN, you can couple the functionality of load balancing for the Load Balance Members, and you can employ a failover adapter.

You can define up to 64 VLANs per team (63 tagged and 1 untagged). VLANs can only be created when all members are AT-2931SX adapters. If you try to create a VLAN with another type of adapter, an error message appears.

Note
Disabled AT-2931SX adapters are not recognized and they prevent the creation of a VLAN. If you attempt to create a VLAN with a disabled AT-2931SX adapter, an error message appears.

To configure a team with a VLAN, perform the following procedure.

Note
To maintain optimum adapter performance, your system must have 64 MB of system memory for each of the 8 VLANs created per adapter.

---

1. Click the name of the team you want to configure.

2. From the **Team Properties** Tab, click **Add VLAN**.

3. Type the *VLAN ID* and *VLAN name*, then click **OK**.

   The **Untagged VLAN** check box is exclusively used by the VLAN ID field. To use VLAN ID 0, simply click this check box. If you type a VLAN name or ID and the name already exists, an Input Error message appears.

4. When you are finished adding VLANs to this team, click **OK**.

   A new virtual adapter is created for each VLAN.

5. Click **Apply**.

6. Click **Yes** when you see the message indicating that the network connection will be temporarily interrupted.

   The available adapters are listed (these adapters are not currently members of any team).

Displaying VLAN Properties and Statistics and Running VLAN Tests

The procedures in this section describe how to display VLAN properties and statistics as well as how to run VLAN tests and delete a VLAN.

To display VLAN properties and statistics and to run VLAN tests, perform the following procedure.

1. Click the name of the VLAN adapter of interest.

2. Click the **Vital Sign** Tab to view the properties of the VLAN adapter.

3. Click the **BASP Statistics** Tab to view the statistics for the VLAN adapter.

4. Click the **Network Test** Tab to run a network test on the VLAN adapter.

To delete a VLAN, perform the following procedure.

1. From the **Tools** menu, click **Configure a Team**.

2. If there is more than one team, click the name of the team that has the VLAN you want to delete and click **OK**.

3. Click **Remove VLAN**.

4. Click **Apply**.

5. Click **Yes** when you see the message indicating that the network connection will be temporarily interrupted.

Note
If you delete a team, the VLANs configured for that team are also deleted.

Saving and Restoring a Configuration

The configuration file is a text file that can be viewed with any text editor. The file contains information about both the adapter and the team configuration. To save and restore a configuration file, see the following procedures.

To save a configuration, perform the following procedure.

1. From the **File** menu, click **Team Save As**.
2. Type the path and file name of the new configuration file and click **Save** (a .bcg extension is added).

To restore a configuration, perform the following procedure.

1. From the **File** menu, click **Team Restore**.
2. Click the name of the file to be restored and click **Open**.

   Note
   You may need to navigate to the folder where the file is located.

   If a configuration is already loaded, a message appears asking if you want to save your current configuration. Click **Yes** to save the current configuration. Otherwise, the configuration data that is currently loaded is lost.

3. Click **Apply** to enable the Save Configuration feature.

Chapter 3

Installing BACS on Windows 2000 and Windows 2003 Systems

This chapter provides procedures for installing the AT-2931SX BACS application and configuring teaming on Windows 2000 and Windows 2003 systems. It contains the following sections:

- “Installing the AT-2931SX BASP” on page 45
- “Uninstalling the AT-2931SX BASP” on page 46

Installing the AT-2931SX BASP

For BASP installation procedures, refer to Chapter 2, "AT-2931SX Broadcom Advanced Control Suite (BACS) Applications" on page 15.

Uninstalling the AT-2931SX BASP

To uninstall the AT-2931SX Broadcom Advanced Server Program Driver Properties (BASP), perform the following procedure:

1. Open the Control Panel
2. Double-click the **Add or Remove Programs** button.
3. Select Broadcom Management Programs and click **Change/Remove**.
4. Click **Next**.

   The InstallShield Wizard screen appears.
5. Click the **Modify** radio button and click **Next**.
6. The Select Components screen appears.

   Four install/uninstall selections are available from this screen.
7. Deselect the **BASP** checkbox, then click **Next**.
8. A question box appears indicating that removing BASP will uninstall your configured adapter team/VLAN. Click **Yes** to continue.
9. When complete, an information screen notifies you that the files were successfully uninstalled.
10. Click **OK** to complete the uninstall.

Chapter 4

Installing BACS on a Linux System

This chapter describes the installation and configuration of the BASP driver on Linux. It includes the following section:

- “BASP Driver for Linux” on page 48
- “Packaging” on page 49
- “Installing BASP” on page 50
- “Installing the BASP Source RPM Package for Red Hat and United Linux” on page 51
- “Installing the AT-2931SX BASP TAR Archive” on page 52
- “AT-2931SX BASP Files” on page 53
- “AT-2931SX BASP Configuration for Red Hat and United Linux Distributions” on page 54
- “AT-2931SX BASP Configuration and Startup for Other Linux Distributions” on page 56
- “AT-2931SX BASP Configuration Scripts for Red Hat Distributions” on page 58
- “Broadcom NICE Patches” on page 59
- “Uninstalling the RPM Package” on page 60
- “Removal of Physical Interface in Generic Trunking and 802.3ad Mode” on page 61
- “AT-2931SX BASP SNMP Agent for Linux” on page 62
- “Known Problems” on page 64

BASP Driver for Linux

On newer Distributions and Kernels, it may be necessary to remove the BASP Driver for Linux

BASP is a kernel module designed for 2.4.x kernels that provides load-balancing, fault-tolerance, and VLAN features. These features are provided by creating teams that consist of multiple NIC interfaces. A team can consist of 1 to 8 NIC interfaces and each interface can be designated as primary or hot-standby (SLB team only). All primary NIC interfaces in a team participate in Load-balancing operations by sending and receiving a portion of the total traffic. Hot-standby interfaces take over in the event that all primary interfaces have lost their links. In addition, VLANs can be added to a team to allow multiple VLANs with different VLAN IDs. A virtual device is created for each VLAN added.

There are three BASP modes:

- SLB mode. This mode works with all Ethernet switches without configuring the switch ports to any special trunking mode. BASP supports Smart Load Balance (SLB™), Generic Trunking and IEEE 802.3ad Link Aggregation. In SLB and 802.3ad modes, all NICE drivers must support Broadcom NIC Extension (NICE).
- Generic trunking mode. This mode does not require NICE and can work with any NIC; however, it requires the Ethernet switch to support the technology and be properly configured. This mode is protocol-independent and all traffic should be load-balanced and fault-tolerant.
- 802.3ad mode. This mode requires NICE drivers and Ethernet switches supporting IEEE 802.3ad Link Aggregation. This mode is protocol-independent and all traffic is load-balanced and fault-tolerant. All the physical interfaces in the 802.3ad teams are defaulted to be LACP active. A 802.3ad team requires that all of the member NICs support NICE. All of the member NICs, once in the 802.3ad team, will be set with the same MAC address.

BASP also provides remote management through the SNMP protocol. This package is installed separately (see “AT-2931SX BASP SNMP Agent for Linux” on page 62).

Packaging

BASP is released in two packaging formats: source RPM and compressed tar formats. The file names for the two packages are basplnx-<version>.src.<arch>.rpm and basplnx-<version>.<arch>.tgz. Identical source files to build the driver are included in both the RPM and TAR source packages.

Installing BASP

BASP for Linux is shipped in mixed forms, where the platform and kernel specific files are in source code and the core file is in object form. Three packages are shipped in this release: two tar archives and two RPM packages.

basplnx-{version}.i386.tgz is the tar archive for i386 platform.

For users of Red Hat or United Linux-based distributions, follow instructions in “Installing the BASP Source RPM Package for Red Hat and United Linux” on page 51.

For users of other Linux i386 distribution, follow instructions in the “Installing the AT-2931SX BASP TAR Archive” on page 52.

Installing the BASP Source RPM Package for Red Hat and United Linux

To install the AT-2931SX BASP RPM source package for Red Hat and United Linux 1.x based distributions, perform the following procedure.

1. To install the RPM source package, run

   ```
   % rpm -i basplnx-{version}.src.{arch}.rpm
   ```

2. Change directory to the RPM path and build the binary driver for the kernel (use rpmbuild for Red Hat 8.0 or later)

   ```
   % cd /usr/src/{redhat or packages}
   % rpm -bb SPECS/basplnx.spec or rpmbuild -bb SPECS/
   basplnx.spec
   ```

   Note
   Each Linux distribution has a unique RPM path.

3. Install the newly built package

   ```
   % rpm -i RPMS/i386/basplnx-{version}.{arch}.rpm
   ```

   The driver and other required files are installed automatically.

4. To load the driver

   ```
   % insmod basp
   ```

5. To set up the teams, refer to "AT-2931SX BASP Configuration for Red Hat and United Linux Distributions" on page 54.

Installing the AT-2931SX BASP TAR Archive

Use the procedures in this section to install Linux i386 distributions that are neither Red Hat nor United Linux distributions. Installing the AT-2931SX BASP TAR archive involves both uncompressing the archive and then installing it.

To uncompress and expand the tar archive, run:

```
% tar xvfz basplnx-{version}.{arch}.tgz
```

To install the AT-2931SX BASP TAR archive, perform the following procedure:

1. After extraction, change to the directory where the BASP source files are located.

   ```
   % cd basplnx-{version}
   ```

2. To build a kernel module, "basp.o":

   ```
   % make
   ```

   Note
   The Make process automatically builds the correct module for different kernel options, for example, symbol versioning and SMP support. Do not define -DMODVERSIONS in the Makefile.

3. To create device file and to copy files:

   ```
   % make install
   ```

4. To update the module reference:

   ```
   % depmod -a
   ```

5. To load the driver:

   ```
   % insmod basp
   ```

6. To set up the teams, see “AT-2931SX BASP Configuration and Startup for Other Linux Distributions” on page 56.

AT-2931SX BASP Files

See Table 3 for a list of the AT-2931SX BASP files.

Table 3. Contents of the release.txt File

Filename	Description
Makefile	makefile
baspcfg	precompiled configuration utility
bcmtype.h	commonly used type header file
blf.c	BASP module entry points
blf.h	ioctl interface
blfcore.h	core interface
blfcore.o	precompiled core object
blfopt.h	automatically generated header file from the Make
blfver.h	version header file
nicext.h	NICE header file
pal.c	platform abstraction implementation
pal.h	header for platform abstraction
release.txt	this file
nice-2.2.16	NICE enabled driver for 2.2 kernel
nice-2.4.16	NICE enabled driver for 2.4 kernel
scripts	contains sample scripts
scripts/basp	init script, goes to /etc/rc.d/init.d
scripts/baspteam	start/stop script, goes to /etc/basp
scripts/baspif	start/stop network, i/f, goes to /etc/basp
scripts/team-sample	sample script of SLB team with three NICs
scripts/team-gec	sample script of GEC team with three NICs
scripts/team-vlan	sample script of SLB team with 2 VLANs
basp.4	man page

Table 3. Contents of the release.txt File (Continued)

Filename	Description
baspcfg.8	man page for baspcfg utility

AT-2931SX BASP Configuration for Red Hat and United Linux Distributions

This section describes the AT-2931SX BASP Configuration for Red Hat and United Linux 1.x based distributions. The AT-2931SX BASP distribution includes a utility program and several scripts for team configuration. Most of the steps are only required after the first time installation. In the following procedure, perform Step 2 "Modify the configuration script," whenever you change the team configuration.

Since Linux distributions do not automatically load drivers for network devices unless the device is configured with an IP address, you must manually configure a network-script file for all of the physical adapters that will be team members. Network script files are located under /etc/sysconfig/network-scripts (Red Hat) or /etc/sysconfig/network (United Linux 1.x). The file name must be prefixed with "ifcfg-" then the physical adapter alias. For interface eth0, you create a file with the name ifcfg-eth0 and then add the content below.

Note
To avoid failover problems when using AT-2931SX BASP, make sure that the spanning tree is disabled on the switch which is connected to the network adapter.

Note
When adding 64 VLANs, the 64th VLAN must have a VLAN ID of 0 (63 VLANs are tagged and 1 VLAN is untagged).

Example:

```
DEVICE=eth0
BOOTPROTO=static
ONBOOT=yes
```

For users of other Linux distributions, follow instructions in the “AT-2931SX BASP Configuration and Startup for Other Linux Distributions” on page 56.

The AT-2931SX BASP configuration process, perform the following procedure:

1. Copy a configuration script from the "/etc/basp/samples" directory to the "/etc/basp" directory.

   Note
   The configuration script name must be prefixed with "team-".

2. Modify the following parameters of the configuration script:

   (a) change the team type
   (b) add or delete the physical network interfaces
   (c) add or delete the virtual network interfaces
   (d) assign IP address to each virtual network interface.

   The syntax of the configuration script can be found in “AT-2931SX BASP Configuration Scripts for Red Hat Distributions” on page 58 or in the /etc/basp/sample/team-sample script file itself. Note that when configuring Teaming, at least one Primary Adapter is required.

3. Manually start the team for the first time:

   ```
   % /etc/init.d/basp start
   ```

   Note
   This step is only required for the first time installation. The team configuration is started automatically on subsequent reboots.

   Note
   If not all of the virtual network interfaces are configured with an IP address, an error message is displayed when starting the AT-2931SX BASP team. If this happens, repeat step 2 to configure an IP address for all of the virtual network interfaces.

   Note
   Forming multiple teams is possible by copying the sample files into "/etc/basp/team-<name>" and modifying this file as described in the sample file.

   Note
   To create more that one virtual interface (VLAN) for each team, refer to the respective description section in the sample files.

AT-2931SX BASP Configuration and Startup for Other Linux Distributions

BASP Configuration (baspcfg) is a command line tool that is used to configure the BASP teams, add/remove NICs, and add/remove virtual devices. This tool can be used in custom initialization scripts. Please read your distribution-specific documentation for more information on your distributor's startup procedures.

Following is an example of this tool:

```
baspcfg v3.0.14 - Broadcom Advanced Server Program
Configuration Utility Copyright (c) 2000-2002 Broadcom
Corporation. All rights reserved.

usage: baspcfg <commands>
```

commands:

Table 4. Commands

Command	Description
addteam <tid> <type> <tname>	create a team
delteam <tid>	delete a team
addva <tid> <vlan_id> <vname> [macaddr]	add a virtual adapter to a team
delva <tid> <vlan_id>	delete a virtual adapter from a team
bind <tid> <role> <device>	bind a physical adapter to a team
unbind <tid> <device>	unbind a physical adapter from a team
show [tid]	display team configurations

where:

Table 5. Parameter Descriptions

Parameter	Description
tid	An unique ID for each team, starting from 0
type	Team type: 0=SLB, 1=FEC/ GEC, 2=802.3ad

Table 5. Parameter Descriptions (Continued)

Parameter	Description
tname	ASCII string of the team
vlan_id	VLAN ID: from 1 to 4094, 0=untagged or no VLAN
vname	ASCII string of the virtual device
macaddr	MAC address (optional), for example, 00:10:18:00:11:44
role	Role of the physical device: 0=primary, 1=hot-standby
device	ASCII string of the physical device, for example, eth0

Note
Baspcfg can only be executed in Super User mode. Attempting to use baspcfg as a standard user yields the following error message, "Error in communicating to BASP Module. Is it loaded?".

When configuring Teaming, one Primary Adapter is required.

AT-2931SX BASP Configuration Scripts for Red Hat Distributions

Both *team-sample* and *team-gec* are configuration scripts that follow the same syntax. See Table 6.

Table 6. Configuration Scripts

Script	Description
TEAM_ID:	this number uniquely identifies a team
TEAM_TYPE:	0 = SLB, 1 = Generic Trunking/GEC/FEC, 2 = 802.3ad
TEAM_NAME:	ascii name of the team
TEAM_PAx_NAME:	ascii name of the physical interface x, where x can be 0 to 7
TEAM_PAx_ROLE:	role of the physical interface x 0 = Primary, 1 = Hot-standby. This field must be 0 for Generic Trunking/GEC/FEC team.
TEAM_VAx_NAME:	ascii name of the virtual interface x, where x can be 0 to 63
TEAM_VAx_VLAN:	802.1Q VLAN ID of the virtual interface x. For untagged virtual interface, that is, without VLAN enabled, set it to 0. The valid VLAN ID can be 0 to 4094.
TEAM_VAx_IP:	IP address of the virtual interface x. The format should be aa.bb.cc.dd.
TEAM_VAx_NETMASK:	Subnet mask of the virtual interface x. The format should mm.nn.oo.pp.

Note
Teaming scripts are intended for Red Hat and United Linux-based distributions ONLY. Use with other Linux distributions may cause an error.

Broadcom NICE Patches

Also included in this release are network device drivers patched with Broadcom NICE support. These drivers are originally taken from the Linux 2.4.16 kernel distribution.

To install patched drivers, perform the following procedure.

1. Copy the NICE header file, "nicext.h", to the appropriate Linux kernel include directory, for example:

   ```
   % cp /usr/src/nice-2.4.16/nicext.h /usr/src/linux/
   include/linux
   ```

2. Rename the original network device driver under the Linux kernel source tree, "/usr/src/linux/drivers/net".

3. Copy the patched drivers to the Linux kernel network driver source directory, i.e. "/usr/src/linux/drivers/net".

4. Follow the kernel rebuild instructions to configure kernel support for these drivers.

   ```
   % cd /usr/src/linux
   % make config
   ```

5. If the patched drivers are configured into the kernel, go to step 7. If the patched drivers are configured as modules, go to step 6.

6. In the case of supporting only the module version of these drivers, it is possible to simply run the following to compile patched drivers and to install them into the proper module directory:

   ```
   % make modules
   % make modules_install
   ```

   There is no need to compile the complete kernel. Go to step 8.

7. Rebuild the kernel to compile these patched drivers:

   ```
   % make clean
   % make dep
   % make
   ```

8. Either reboot the system or unload/load the patched modules. Run configuration scripts to test the patch.

Uninstalling the RPM Package

To uninstall a RPM package, perform the following procedure.

```
% rpm -e basplnx
```

and to reboot the system,

```
% reboot
```

Removal of Physical Interface in Generic Trunking and 802.3ad Mode

In Generic Trunking and 802.3ad mode, all the physical and virtual interfaces belonging to a team have the same MAC address. This MAC address is the same address as that of the first physical interface bounded to the team. If the first physical interface is removed dynamically from the team using the "baspcfg" tool and bounded to the protocol directly, this could lead to a duplicate MAC address problem on the network. To properly remove a physical interface, perform the following procedure.

1. Backup the original team configuration script

   ```
   % cp /etc/basp/team-gec /etc/basp/backup-gec
   ```

   Note
   "team-gec" is the name of the configuration script.

   Note
   "backup-gec" is the name of the backup script. The name of the backup script must NOT be prefixed with "team-".

2. Modify the team configuration script to remove the physical interface.

3. Stop the running team.

   ```
   % /etc/basp/baspif /etc/basp/backup-gec stop
   % /etc/basp/baspteam /etc/basp/backup-gec del
   ```

4. Restart the team.

   ```
   % /etc/basp/baspteam /etc/basp/team-gec add
   % /etc/basp/baspif /etc/basp/team-gec start
   ```

AT-2931SX BASP SNMP Agent for Linux

This SNMP agent is designed to support the configuration and statistics information pertaining to the AT-2931SX BASP driver. The AT-2931SX BASP SNMP agent is available in two packaging formats: TAR archive and RPM. Both packages include the same script and MIB files.

Installing the TAR Archive

To uncompress and expand the tar archive, run:

```
% tar xvfz baspsnmp-{version}.tar
```

To install AT-2931SX BASP SNMP agent for Linux, perform the following procedure.

1. Copy the getBaspInfo and genBaspTraps script files into /usr/bin directory.
2. Copy the BASP-Config-MIB.txt, BASP-Statistics-MIB.txt and Brcm-BSAPTrap-MIB.txt into the /usr/share/snmp/mibs directory.
3. Locate the snmpd.conf file.

   It is usually located in one of the following directories:

   ```
   /etc/snmp

   /usr/lib/snmp

   $HOME/.snmp
   ```

4. Add the following lines to the snmpd.conf.

   ```
   pass .1.3.6.1.4.1.4413.1.2.1 /usr/bin/getBaspInfo
   pass .1.3.6.1.4.1.4413.1.2.2.1 /usr/bin/getBaspInfo
   pass .1.3.6.1.4.1.4413.1.2.2.2 /usr/bin/getBaspInfo
   pass .1.3.6.1.4.1.4413.1.2.2.3 /usr/bin/getBaspInfo
   ```

5. Stop the snmpd daemon and restart it again.

   ```
   % /etc/init.d/snmpd stop
   % /etc/init.d/snmpd start
   ```

6. Run the genBaspTraps script to allow monitoring of the AT-2931SX BASP trap events:

   ```
   % genBaspTraps
   ```

   This script can be terminated by hitting Ctrl-C keys if AT-2931SX BASP trap event monitoring is no longer needed.

7. The *snmpget* and *snmpgetnext* commands can be used to receive the AT-2931SX BASP snmp objects such as:

```
% snmpget localhost public BASP-Config-MIB::btTeamNumber
% snmpgetnext localhost public BASP-Config-
MIB::btTeamNumber
```

AT-2931SX BASP SNMP objects are provided in the following text files:

- BASP-Config-MIB.txt
- BASP-Statistics-MIB.txt
- Brcm-BSAPTrap-MIB.txt

Installing the RPM Package

Complete the following steps to install AT-2931SX BASP SNMP agent from the RPM package.

1. To install the RPM package, run:

```
% rpm -i baspsnmp-{version}.i386.rpm
```

The AT-2931SX BASP script and MIB files are installed. The snmpd.conf configuration file is modified to add support for the AT-2931SX BASP SNMP agent.

2. Follow steps 4 - 6 in the "Installing the TAR Archive" on page 62.

Note
The current RPM installation fails to append the additional directives needed to the snmpd.conf file to support Basp objects. Therefore, follow the instruction (3) in the Install - TAR archive to modify the snmpd.conf file.

SNMP Files

See Table 7 for a list of supported SNMP files.

Table 7. SNMP Files

Filename	Description
genBaspTrap	script monitoring the BASP trap events
getBaspInfo	script to process SNMP get/getnext inquiries
BASP-Config-MIB.txt	SNMP MIB file for BASP configuration objects
BASP-Statistics-MIB.txt	SNMP MIB file for BASP statistics objects

Table 7. SNMP Files (Continued)

Filename	Description
Brcm-BSAPTrap-MIB.txt	SNMP MIB file for BASP trap objects
release.txt	this file

Uninstalling the RPM Package (Both Source and Binary)

To uninstall RPM package, run:

```
% rpm -e baspsnmp-{version}.i386.rpm
```

and to reboot the system,

```
% reboot
```

Known Problems

The 802.3ad team member links disconnect and reconnect continuously when connected to the HP2524 switch. This is a 3rd party issue. It is seen only when configuring an 802.3ad team with more than 2 members on the server and connecting to an HP2524 switch, with LACP enabled as passive or active. The HP switch shows an LACP channel brought up successfully with only 2 members. All other member's links disconnect and reconnect. This issue does not occur with a Cisco Catalyst 6500.

Chapter 5

Key Protocols and Interfaces

This chapter describes the key protocols and interfaces. It contains the following sections:

- “Adapter Teaming” on page 66
- “Failover Teaming” on page 68
- “VLANs Overview” on page 69

Adapter Teaming

Teaming provides traffic load balancing and redundant adapter operation in the event that a network connection fails. When multiple AT-2931SX adapters are installed in the same server, they can be grouped into teams. Each team can be configured on the server with up to 8 ports. If traffic is not identified on any of the adapter team members connections due to failure of the adapter, cable, switch port, or switch (where the teamed adapters are attached to separate switches), the load distribution is reevaluated and reassigned among the remaining team members. In the event that all of the primary adapters are down, the hot standby adapter becomes active. Existing sessions are maintained, causing no user impact.

AT-2931SX BASP supports four schemes of load balancing: Smart Load Balancing, Link Aggregation (802.3ad), Generic Link Aggregation (Trunking), and Smart Load Balance Auto-Failback Disable. These schemes are described in the following sections.

Smart Load Balancing (SLB)™

The implementation of load balancing is based on IP flow. This feature supports balancing IP traffic across multiple adapters (that is, team members) in a bi-directional manner. In this mode, all adapters in the team have separate MAC addresses. It provides automatic fault detection and dynamic failover to other team members or to a hot standby member. This is done independently of the layer 3 protocol (IP, IPX, or Net Beui). It works with existing layer 2 and 3 switches.

Link Aggregation (802.3ad)

This mode supports Link Aggregation and conforms to the IEEE 802.3ad (LACP) specification. Configuration software allows you to dynamically configure which adapters you want to participate in a given team. If there are 4 adapters in the system, you can select between 2 and 4 adapters to participate in the team.

If the link partner is not correctly configured for 802.3ad link configuration, errors are detected and noted. With this mode, all adapters in the team are configured to receive packets for the same MAC address. The outbound load-balancing scheme is determined by our BASP driver. The team's link partner determines the load-balancing scheme for inbound packets. In this mode, at least one of the link partners must be in the active mode.

Generic Link Aggregation (Trunking)

This mode is very similar to 802.3ad in that you need to configure all of the adapters in the team to receive packets for the same MAC address. However, generic link aggregation mode does not provide LACP or marker protocol support. This mode supports a variety of environments where the NICs' link partners are statically configured to support a proprietary trunking mechanism. For instance, this mode could be used to support Lucent's "OpenTrunk" or Cisco's Fast EtherChannel (FEC).

Basically, generic link aggregation mode is a "light" version of the 802.3ad link aggregation and is often referred to as 802.3ad static. This approach is much simpler because there is not a formalized link aggregation control protocol. As with the other modes, the creation of teams and the allocation of physical adapters to various teams is done statically via user configuration software.

Trunking supports load balancing and failover for both the outbound and inbound traffic.

Smart Load Balance Auto-Failback Disable

This team is almost identical to Smart Load Balance and Failover with one exception. If a primary member comes back on line when the standby member is active, the team continues using the standby member rather than switching to the primary member.

Failover Teaming

Failover Teaming provides a redundant adapter operation in the event that a network connection fails. When multiple Gigabit Ethernet Adapters are installed in the same server, they can be paired into teams. Each team must have at least one adapter, but can support up to eight adapters. The number of teams is limited by the number of adapters that are installed.

If the primary adapter in a team is disconnected because the adapter, cable, or switch port fails, the secondary team member becomes active. In this case, the secondary team member redirects both the inbound and outbound traffic originally assigned to the primary adapter. Sessions are maintained; consequently, there is no impact to the user.

Note
Allied Telesyn recommends disabling STP when using the teaming and fault tolerance features.

VLANs Overview

VLANs allow you to split your physical LAN into logical subparts, to create logical segmentation of workgroups, and to enforce security policies among each logical segment. Each defined VLAN behaves as its own separate network, with its traffic and broadcasts isolated from the others, increasing bandwidth efficiency within each logical group. Up to 64 VLANs (63 tagged and 1 untagged) can be defined for each AT-2931 adapter in your server, depending on the amount of available memory in your system.

Although VLANs are commonly used to create individual broadcast domains and/or separate IP subnets, it is sometimes useful for a server to have a presence on more than one VLAN simultaneously. The AT-2931SX adapters support multiple VLANs on a per-port or per-team basis, allowing very flexible network configurations.

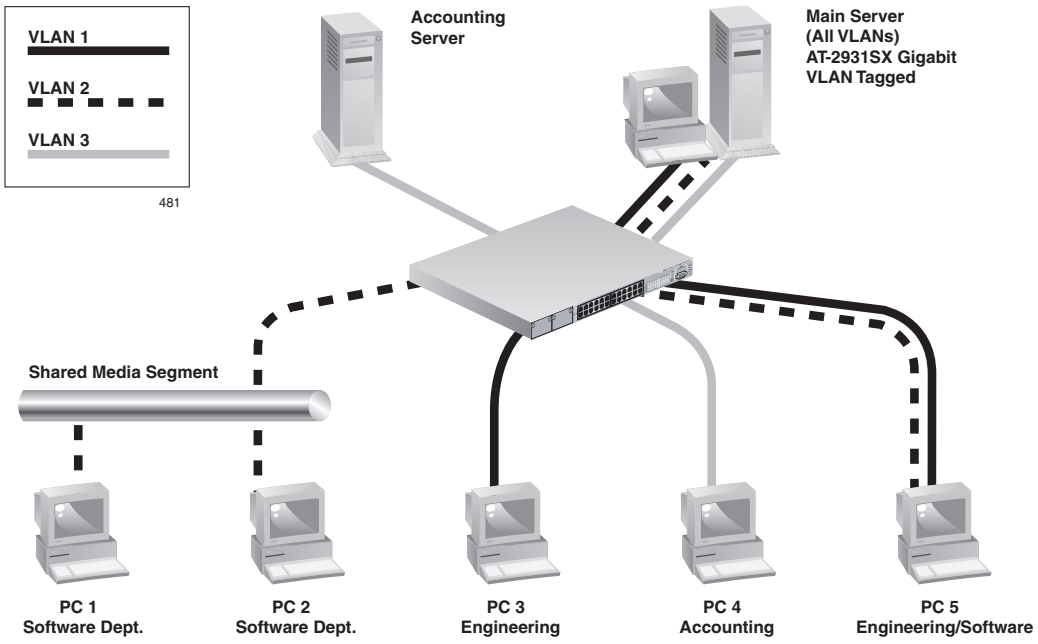

Figure 14. Example of Servers Supporting Multiple VLANs with Tagging

Figure 14 on page 69 shows an example network that uses VLANs. In this example network, the physical LAN consists of a switch, two servers, and five clients. The LAN is logically organized into three different VLANs, each representing a different IP subnet. The features of this network are described in Table 8.

Table 8. Example VLAN Network Topology

Component	Description
VLAN #1	An IP subnet consisting of the Main Server, PC #3, and PC #5. This subnet represents an engineering group.
VLAN #2	Includes the Main Server, PCs #1 and #2 via shared media segment, and PC #5. This VLAN is a software development group.
VLAN #3	Includes the Main Server, the Accounting Server and PC #4. This VLAN is an accounting group.
Main Server	A high-use server that needs to be accessed from all of the VLANs and IP subnets. The Main Server has an AT-2931SX adapter installed. All three IP subnets are accessed via the single physical adapter interface. The server is attached to one of the switch ports, which is configured for VLANs #1, #2, and #3. Both the adapter and the connected switch port have tagging turned on. Because of the tagging VLAN capabilities of both devices, the server is able to communicate on all three IP subnets in this network, but continues to maintain broadcast separation between all of them.
Accounting Server	Available to VLAN #3 only. The Accounting Server is isolated from all traffic on VLANs #1 and #2. The switch port connected to the server has tagging turned off.
PCs #1 and #2	Attached to a shared media hub that is then connected to the switch. PCs #1 and #2 belong to VLAN #2 only, and are logically in the same IP subnet as the Main Server and PC #5. The switch port connected to this segment has tagging turned off.
PC #3	A member of VLAN #1, PC #3 can communicate only with the Main Server and PC #5. Tagging is not enabled on PC #3’s switch port.
PC #4	A member of VLAN #3, PC #4 can only communicate with the servers. Tagging is not enabled on PC #4’s switch port.

Table 8. Example VLAN Network Topology (Continued)

Component	Description
PC #5	A member of both VLANs #1 and #2, PC #5 has an AT-2931SX adapter installed. It is connected to switch port #10. Both the adapter and the switch port are configured for VLANs #1 and #2 and have tagging enabled.

Note
VLAN tagging is only required to be enabled on switch ports that create trunk links to other switches. It is also required on ports connected to tag-capable end-stations, such as servers or workstations with AT-2931SX adapters.

VLANs Support

Virtual Local Area Networks (VLANs) are commonly used to split up groups of network users into manageable broadcast domains, to create logical segmentation of workgroups, and to enforce security policies among logical segments.

Each Team supports up to 64 VLANs. Note that only the AT-2931SX adapters can be part of a team with VLANs. With multiple VLANs on an adapter, a server with a single adapter can have a logical presence on multiple IP subnets. With multiple VLANs in a team, a server can have a logical presence on multiple IP subnets and benefit from load balancing and failover.

Note
Adapters that are members of a failover team can also be configured to support VLANs.

Adaptive Interrupt Frequency

Based on traffic conditions, the adapter driver intelligently adjusts host interrupt frequency to increase overall application throughput. When traffic is light, the adapter driver interrupts the host for each received packet, minimizing latency. When traffic is heavy, the adapter issues one host interrupt for multiple, back-to-back incoming packets, preserving the host CPU cycles.

Dual DMA Channels

The PCI interface on the Gigabit Ethernet Adapter contains two independent DMA channels for simultaneous read and write operations.

32-bit or 64-bit PCI Bus Master

Compliant with PCI Local Bus Rev 2.2, the PCI interface on the Gigabit Ethernet Adapter is compatible with both 32-bit and 64-bit PCI buses. As a bus master, the adapter requests access to the PCI bus, instead of waiting to be polled.

ASIC with Embedded RISC Processor

The core control for the Gigabit Ethernet Adapter resides in a tightly integrated, high-performance ASIC. The ASIC includes dual RISC processors. This provides the flexibility to add new features to the card and adapt it to future network requirements via a software download. This also enables the adapter drivers to exploit the built-in host offload functions on the adapter as host operating systems are enhanced to take advantage of these functions.

Chapter 6

Troubleshooting

This chapter describes troubleshooting procedures. It contains the following sections:

- “Verifying the Correct Drivers are Loaded” on page 74
- “Software Problems and Solutions” on page 76

Verifying the Correct Drivers are Loaded

The following section describes how to check if the correct drivers are loaded for Windows and Linux.

Windows

The AT-2931SX Broadcom Advanced Control Suite, Vital Sign screen allows you to view vital adapter information, network status, and network connectivity. Active adapters are listed on the Vial Sign screen.

1. From the Vital Sign screen, select the AT-2931SX adapter to be tested.

2. Press **Refresh** to display the driver status of the selected adapter.

> **Note**
> The information for other adapters is less comprehensive than the information listed for the AT-2931SX adapter.

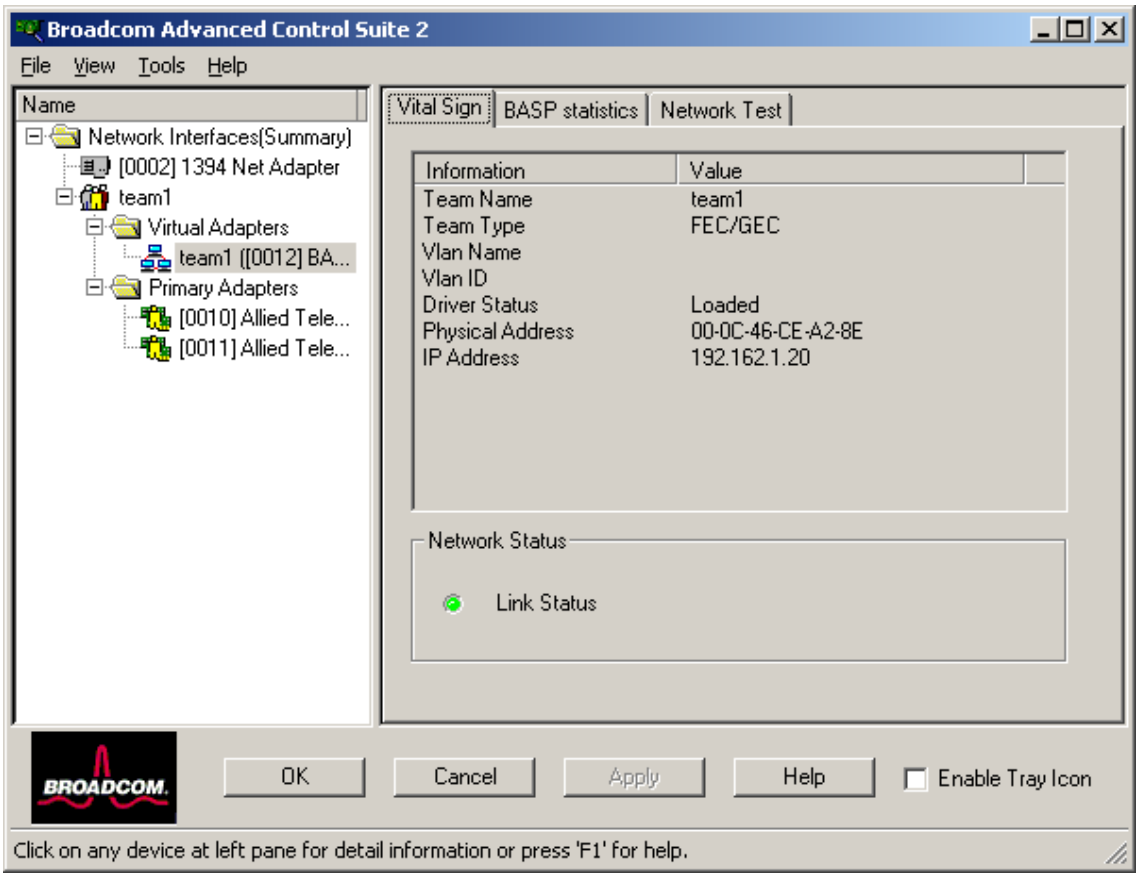

Figure 15. Vital Sign Tab, Troubleshooting

Linux

To verify that the Linux Driver software is loaded correctly, perform the following procedure.

1. To verify that the AT-2931SX bcm5700.o driver is loaded properly, run:

   ```
   lsmod
   ```

   If the driver is loaded, a line similar to the one below appears, where <*size*> is the size of the driver in bytes, and <*n*> is the number of adapters configured. See Table 9.

Table 9. Linux Driver Software Information

Module	Size	Used by
BCM5700	<*size*>	<*n*>

Software Problems and Solutions

This section describes common software problems and solutions. It contains the following subsections:

- ❒ “Windows 2000” on page 76
- ❒ “Linux-BASP” on page 77
- ❒ “AT-2931SX Broadcom Advanced Server Program (BASP)” on page 78

Windows 2000

This section lists known problems and solutions when using Windows 2000.

Problem: Uninstalling the BASP software and you are prompted to reboot early.

Solution: After configuring a BASP team, the Windows 2000 system may sometimes prompt you to reboot. This is because Plug and Play on W2k may fail to commit any change in the network protocol binding. You can choose not to reboot and continue configuring the intermediate driver without causing any side effects. When you have finished the configuration, you must reboot the system.

Problem: Cannot enable VLAN after it is disabled.

Solution: The BASP application creates additional network connections in the "Network Connection and Dial-up" Window. Similar to physical network connections, these virtual connections can be disabled via the context menu. However, if these virtual connections are re-enabled, the system reports a "connection failed!" error. This is a known problem with the Windows 2000 system. When this happens, rebooting the system reenables the virtual connection.

Problem: Able to configure Internet Connection Sharing (ICS) when there aren't any unassigned adapters.

Solution: Windows 2000 networking is shipped with the Internet Connection Sharing (ICS) application, which is designed to allow multiple computers to access the Internet via a Windows 2000 system. To configure the ICS application, you need to select a network connection as an "outside" connection and another network connection as an "inside" connection. However, the ICS application allows you to select any available network connection as an "outside" or "inside" connection, regardless of the BASP team configuration. Allied Telesyn recommends that you do not select any network connection that is part of the BASP team to be "outside" or "inside."

Problem: Team configuration is not retained when you edit it.

Solution: In configuring BASP team configuration, the actual changes of the configuration are not committed until you click "OK" in the "Network Properties" window. If you do not click "OK" and, instead, return to the BASP team configuration window, all the previous uncommitted changes are lost. This requires you to reenter the configuration. As a workaround, always click "OK" in the "Network Properties" window after making changes.

Problem: IP address is configurable on a member of the team.

Solution: When a team is created, the TCP/IP properties for the adapters are unselected. You can select and configure the TCP/IP properties of the adapters and configure an IP address manually. This issue is a limitation of the Windows 2000 network installation paradigm where this invalid configuration is still allowed.

Problem: When creating 64 VLANs, all virtual adapters are displayed as disconnected or one of the 64 VLANs is displayed as disabled.

Solution: The maximum VLAN configurations are 63 tagged and one untagged VLAN ID 0. If 64 tagged VLANs are created, they are disconnected. A reboot is required and only the 63 tagged VLANs show links, while the 64th VLAN is disabled.

Linux-BASP

This section lists known problems and solutions using Linux-BASP.

Problem: When obtaining the IP for a SLB's virtual interface via DHCP, the IP-gets lost under heavy traffic.

Solution: Always set a static IP for all the virtual interfaces in a SLB team.

Problem: Make install fails on Turbo Linux 7.0 IA64.

Solution: The symbolic link under /lib/modules/<kernel-version>/build points to an empty directory. To successfully install BASP using `make install`, re-link /lib/modules/<kernel-version>/build to point to /usr/src/<kernel-version>/.

AT-2931SX Broadcom Advanced Server Program (BASP)

This section lists known AT-2931SX BASP problems and solutions that apply to all operating systems.

Problem: 802.3ad team member links disconnect and reconnect continuously.

Solution: This is a 3rd party issue. It is seen only when configuring an 802.3ad team with more than 2 members on the server and connecting an HP2524 switch, with LACP enabled as passive or active. The HP switch shows an LACP channel being brought up successfully with only 2 members. All other member's links disconnect and reconnect.

> **Note**
> This issue does not occur with a Cisco Catalyst 6500.

Chapter 7

Manageability Features

This chapter describes the magageability features. It contains the following sections:

- “CIM” on page 80
- “SNMP” on page 81

CIM

The Common Information Model (CIM) is an industry standard defined by the Distributed Management Task Force (DMTF). Microsoft implements CIM on Windows platforms such as Windows 2000 and Windows Server 2003 systems. Allied Telesyn supports CIM on the Windows 2000 and the Windows Server 2003 platforms.

Allied Telesyn's implementation of CIM provides various classes that provide information to users through CIM client applications. (Please note that the AT-2931SX Broadcom CIM data provider provides data only.) You can choose your preferred CIM client software to browse the information provided by the AT-2931SX Broadcom CIM provider.

The AT-2931SX Broadcom CIM provider provides information through the BRCM_NetworkAdapter and BRCM_ExtraCapacityGroup classes. The BRCM_NetworkAdapter class provides network adapter information pertaining to a group of adapters including the AT-2931SX adapter and other vendors' controllers. The BRCM_ExtraCapacityGroup class provides team configuration for the AT-2931SX BASP feature. Current implementation provides team information as well as information about physical network adapters in the team.

AT-2931SX BASP provides events through event logs. You can use the "Event Viewer" provided by Windows 2000 and Windows Server 2003. Or, you can use CIM to inspect or monitor these events. AT-2931SX BASP provider also provides event information through the CIM's generic event model. These events are __InstanceCreationEvent, __InstanceDeletionEvent and __InstanceModificationEvent. These events are defined by CIM. In addition, CIM requires the client application to register the events from the client application, using queries as examples (shown below) in order to receive events properly.

```
SELECT * FROM __InstanceModificationEvent where
TargetInstance ISA "BRCM_NetworkAdapter"
SELECT * FROM __InstanceModificationEvent where
TargetInstance ISA "BRCM_ExtraCapacityGroup"
SELECT * FROM __InstanceCreationEvent where
TargetInstance ISA "BRCM_NetworkAdapter"
SELECT * FROM __InstanceDeletionEvent where
TargetInstance ISA "BRCM_NetworkAdapter"
SELECT * FROM __InstanceCreationEvent where
TargetInstance ISA "BRCM_ActsAsSpare"
SELECT * FROM __InstanceDeletionEvent where
TargetInstance ISA "BRCM_ActsAsSpare"
```

For detailed information about these events, please refer to the CIM documentation.

SNMP

There are two SNMP agents for manageability:

- BASP Sub-agent
- BASP Extensible-agent

See the following sections.

BASP Sub-agent

The BASP sub-agent, baspmgnt.dll, is designed for the Windows 2000 and Windows Server 2003 SNMP service. It is required to install the SNMP service before installing BASP subagent.

The BASP subagent allows the SNMP manager software to actively monitor the configurations and performance of the AT-2931SX BASP features. The subagent also provides an alarm trap to an SNMP manager to inform the manager of any changes to the conditions of the AT-2931SX BASP component.

The BASP subagent allows monitoring of the configurations and statistics for the BASP teams, the physical NIC adapters participating in a team, and the virtual NIC adapters created as the result of teaming. The BASP configuration data includes information such as team IDs, physical/virtual/VLAN/team adapter IDs, physical/virtual/VLAN/team/ adapter descriptions, and MAC addresses of the adapters.

Note
Non-teamed NIC adapters are not monitored at this time

The statistics include detailed information such as data packets transmitted and received for the physical/virtual/VLAN/team adapters.

The alarm trap forwards information about configuration changes to the physical adapters participating in a team, such as physical adapter link up/down and adapter installed/removed events.

To monitor this information, an SNMP manager needs to load the AT-2931SX BASP MIB database files to allow monitoring of the information described above. These files are shown below:

```
baspconfig.mib
baspstat.mib
basptrap.mib
```

AT-2931SX BASP Extensible-agent

The AT-2931SX Broadcom SNMP extensible-agent, bcmif.dll, is designed for the Windows 2000 and Windows Server 2003 SNMP service. The software requires that a Windows 2000 SNMP service is installed before installing the extensible-agent.

The extensible-agent allows the SNMP manager software to actively monitor the configurations of the Interface Card. It is intended to supplement the information already provided by the standard SNMP Management Network Interface information.

The extensible-agent provides in-depth information about an AT-2931SX adapter, such as:

- MAC address
- bound IP address
- IP subnet mask
- physical link status
- adapter state
- line speed
- duplex mode
- memory range
- interrupt setting
- bus number
- device number
- function number

To monitor the information listed above, a SNMP manager needs to load the MIB file.

The monitored workstation requires the installation of the AT-2931SX Broadcom SNMP extensible-agent, bcmif.dll, and requires the Microsoft Windows 2000 or Windows Server 2003 SNMP service to be installed and loaded.